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-	561	(280/304.1).CCLS.	USPAT; US-PGPUB	2003/07/24 10:32
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-	45	(472/97).CCLS.	USPAT; US-PGPUB	2003/07/28 08:45
-	108	(472/130).CCLS.	USPAT; US-PGPUB	2003/07/28 08:55
-	71	(472/1).CCLS.	USPAT; US-PGPUB	2003/07/28 09:08
-	317	(472/96,2,3,13).CCLS.	USPAT; US-PGPUB	2003/07/28 09:37
-	378	(472/27,28,29,32,36,43).CCLS.	USPAT; US-PGPUB	2003/07/31 09:35
-	361	(434/247).CCLS.	USPAT; US-PGPUB	2003/07/30 17:13
-	170	(434/55).CCLS.	USPAT; US-PGPUB	2003/07/30 17:18
-	367288	roller coaster	USPAT; US-PGPUB	2003/07/30 17:21
-	40244	harness	USPAT; US-PGPUB	2003/07/30 17:18
-	4644	(roller coaster) and harness	USPAT; US-PGPUB	2003/07/30 17:21
-	394	roller adj coaster	USPAT; US-PGPUB	2003/07/30 17:25
-	49	(104/61).CCLS.	USPAT; US-PGPUB	2003/07/30 17:29
-	24	(104/62).CCLS.	USPAT; US-PGPUB	2003/07/30 17:35
-	225	(104/53).CCLS.	USPAT; US-PGPUB	2003/07/30 17:36
-	8	("1789680" | "5605462" | "5669773" | "5695406" | "5752834" | "5772513" | "5857917" | "5860808").PN.	USPAT	2003/07/30 17:50
-	155	(297/61).CCLS.	USPAT; US-PGPUB	2003/07/31 09:59
-	153	(297/181).CCLS.	USPAT; US-PGPUB	2003/07/31 10:08
-	506	(297/410).CCLS.	USPAT; US-PGPUB	2003/07/31 10:09
-	164	(297/112).CCLS.	USPAT; US-PGPUB	2003/08/01 10:30
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United States Patent [19]

Mulholland

[11] **Patent Number: 4,813,746**

[45] **Date of Patent: Mar. 21, 1989**

[54] **WHEELCHAIR PELVIC SUPPORT ARMS**

[75] Inventor: **Lawrence K. Mulholland**, Santa Paula, Calif.

[73] Assignee: **Mulholland Designs, Inc.**, Wilmington, Del.

[21] Appl. No.: **90,018**

[22] Filed: **Aug. 27, 1987**

[51] **Int. Cl.**[4] **A47C 31/00**

[52] **U.S. Cl.** **297/488**; 128/78; 297/464

[58] **Field of Search** 297/487, 488, 467; 128/68, 69, 70, 78, 134

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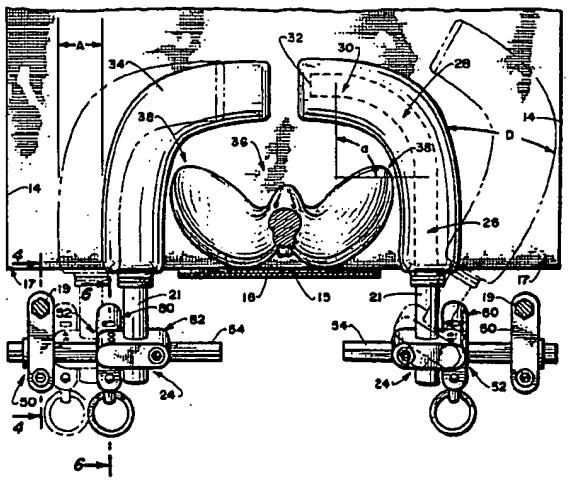
Primary Examiner—Charles Pearson
Assistant Examiner—Lane E. Hardwicke
Attorney, Agent, or Firm—Kenneth J. Hovet

[57] **ABSTRACT**

An angular bar is mounted on each opposing lower portion of a wheelchair frame for securement of the pelvis of a person seated in the wheelchair. Each bar has a side portion that extends across the lateral regions of the hip and a front portion that extends in front of the hips above the thighs. Universal adjustment means with a quick release mechanism are provided for independent adjustment of each arm.

9 Claims, 4 Drawing Sheets



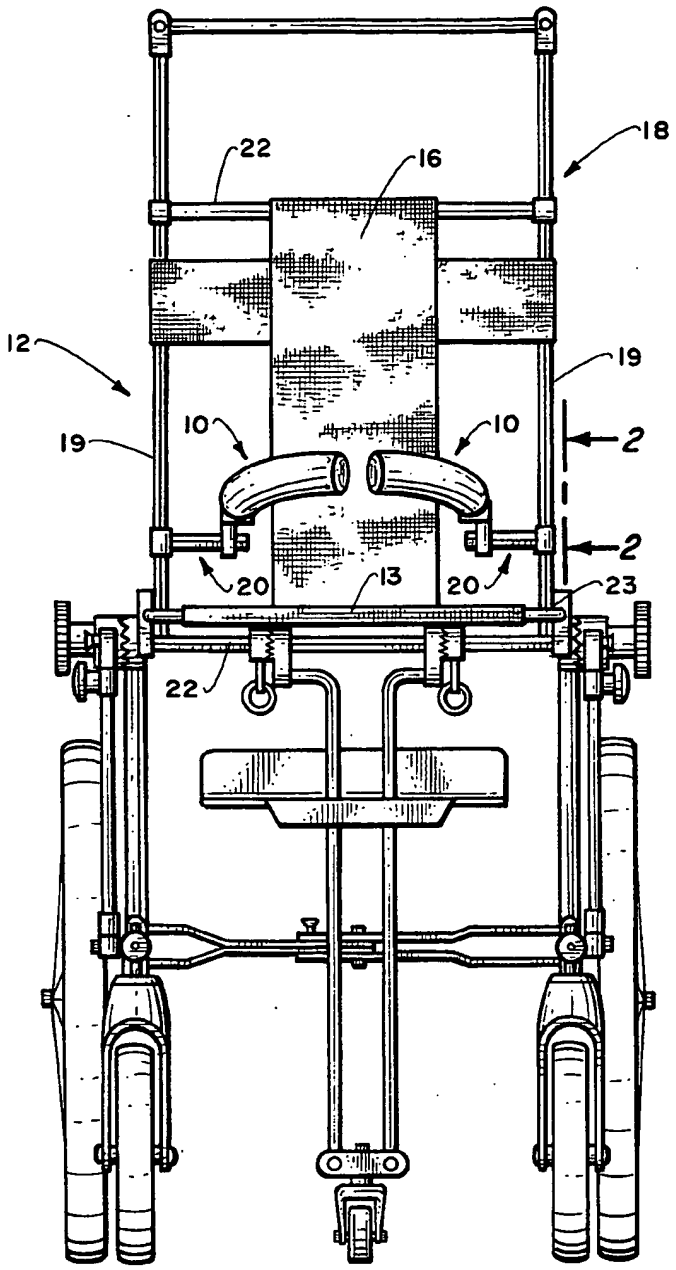


Fig. 1.

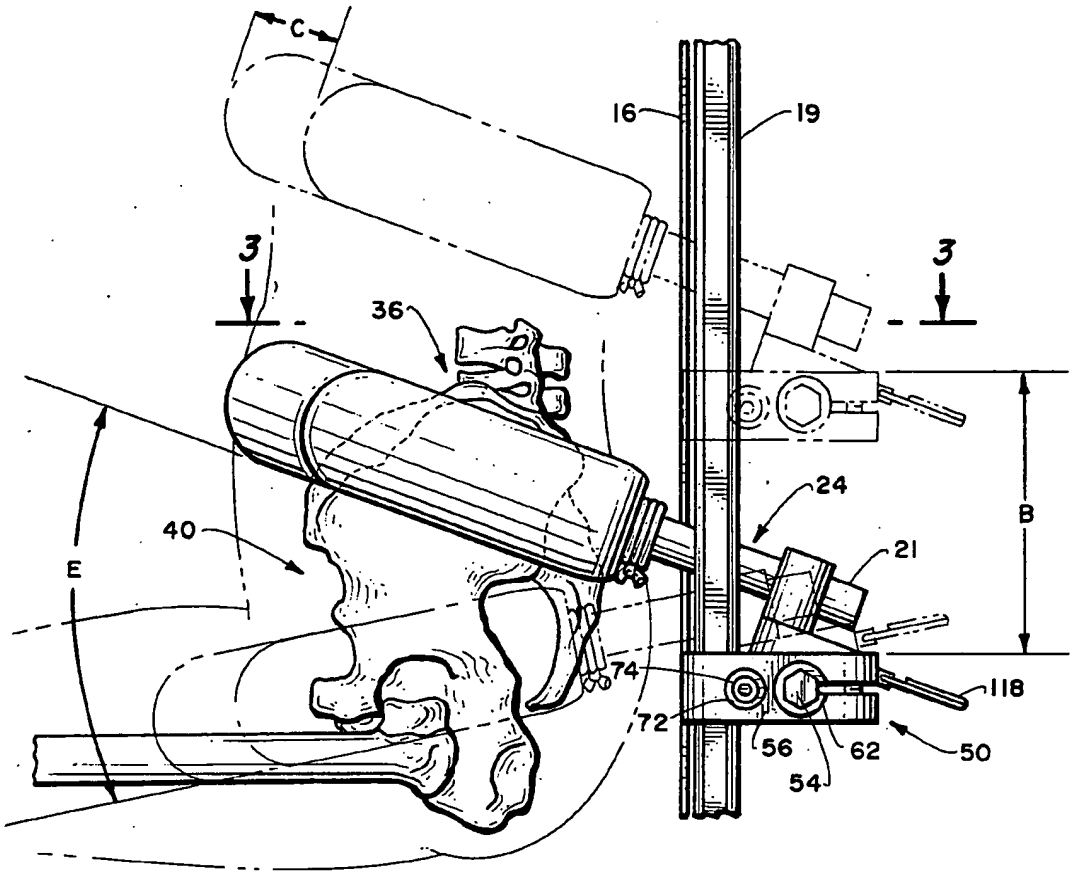


Fig. 2.

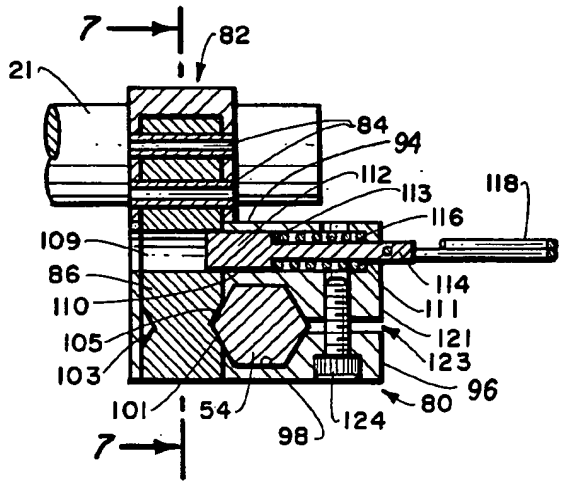


Fig. 6.

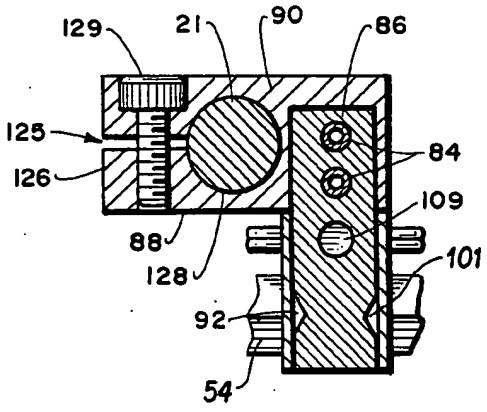


Fig. 7.

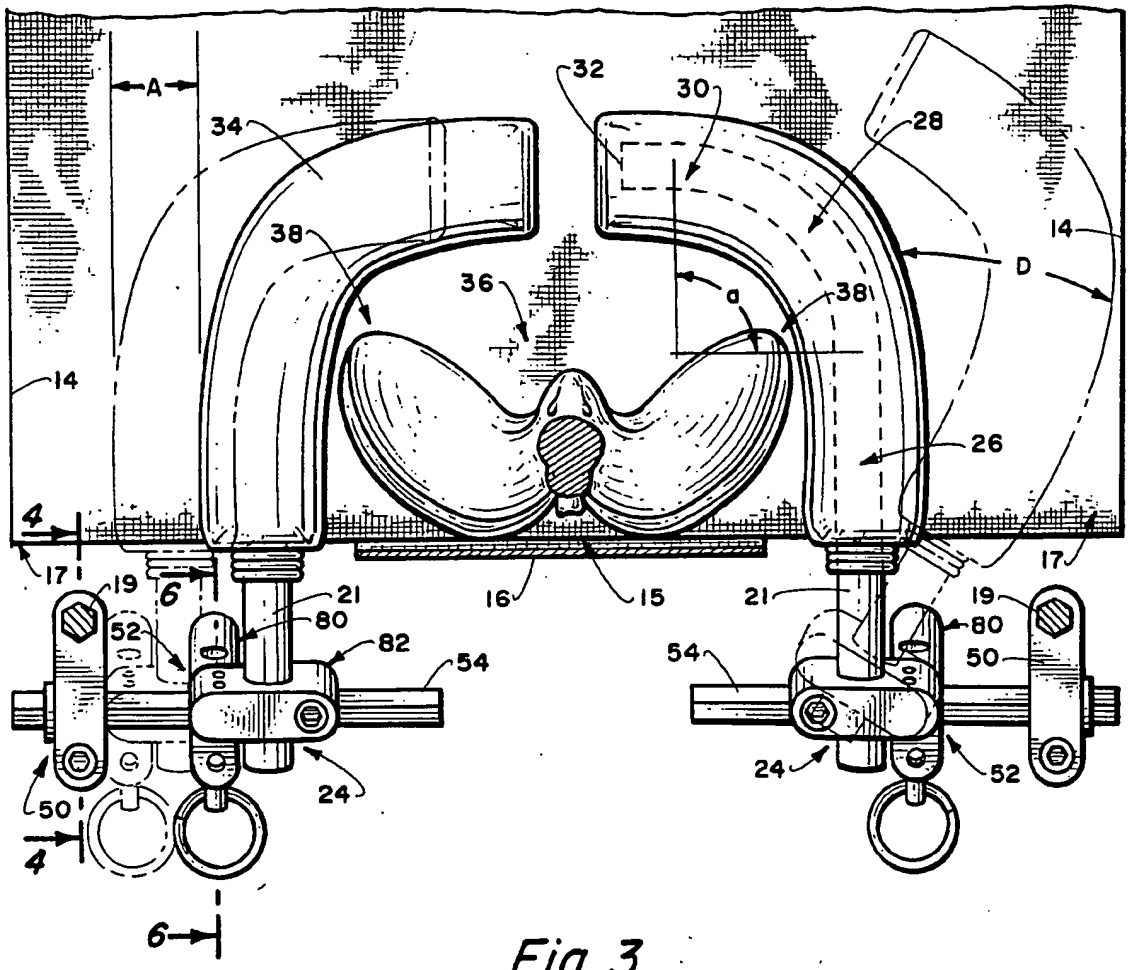


Fig. 3.

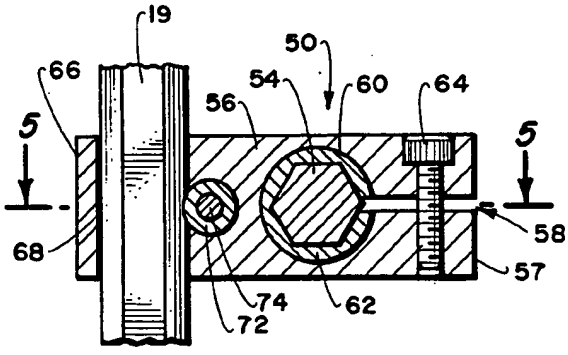


Fig. 4.

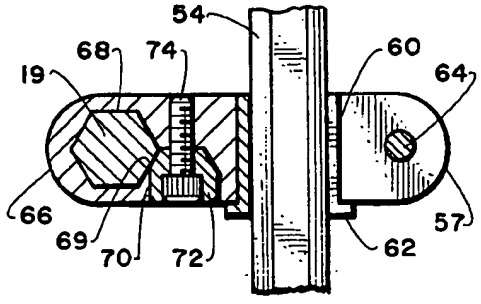


Fig. 5.

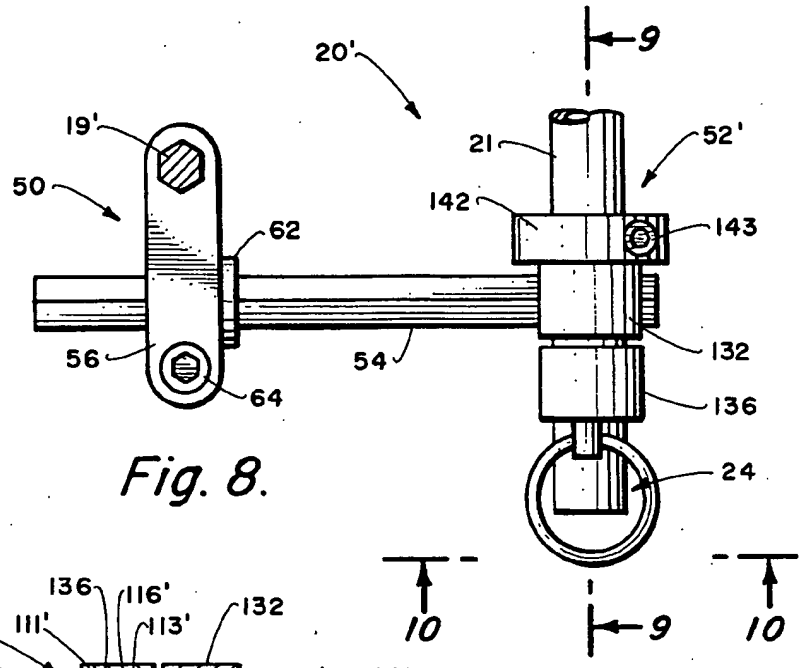


Fig. 8.

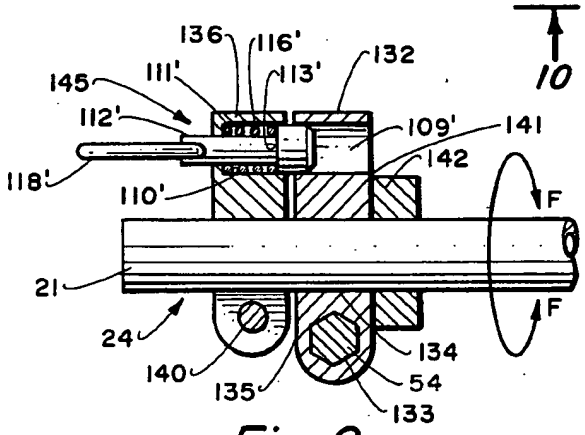


Fig. 9.

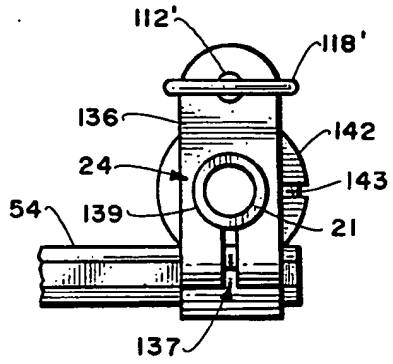


Fig. 10.

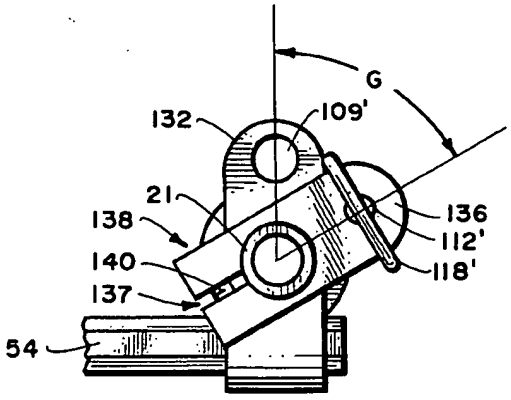


Fig. 11.

WHEELCHAIR PELVIC SUPPORT ARMS

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to wheelchairs and, more particularly, to means on a wheelchair for effectively orienting and securing the pelvis of a person seated in a wheelchair.

2. Brief Description of the Prior Art

Probably the most notorious device for securing a patient's hips to a wheelchair is a seat belt. Such a device, however, provides no lateral support or pelvic orientation capability. It merely functions as a restraint which, if secured tightly, inhibits blood circulation and possibly damages tissue.

Large torso pads mounted on the sides of a wheelchair are shown in U.S. Pat. No. 3,815,586. The pads are used for correcting scoliosis. Similar pads are shown in U.S. Pat. No. 4,073,537. These pads are adjustable and can impinge the sides of one's torso, hip or thigh. Such lateral support is an improvement over seat belts, but gives no frontal stability or overall pelvic control.

U.S. Pat. No. 4,617,919 describes a wheelchair that provides a variety of posture support pads for a patient's neck, shoulders, trunk and thighs. Again, however, the trunk pads simply contact the sides of a user's hips and thereby provide only limited pelvic support.

SUMMARY OF THE INVENTION

The present invention provides a wheelchair having means for secure and accurate pelvic positioning. Curved support arms lock over iliac spin regions of the pelvis. The arms have adjustment means for securing their location in an infinite variety of positions over a patient's hips. This provides a degree of pelvic control not attainable in the prior art.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front elevational view of a wheelchair with pelvic support bars attached and in a constraint position.

FIG. 2 is an enlarged fragmentary side elevational view taken along lines 2—2 of FIG. 1.

FIG. 3 is a plan view taken along lines 3—3 of FIG. 2.

FIG. 4 is a cross-sectional view taken along lines 4—4 of FIG. 3.

FIG. 5 is a cross-sectional view taken along lines 5—5 of FIG. 4.

FIG. 6 is a cross-sectional view taken along lines 6—6 of FIG. 3 rotated to a horizontal upright position for clarity.

FIG. 7 is a cross-sectional view taken along lines 7—7 of FIG. 6.

FIG. 8 is a top plan view of an alternative arm adjustment means which can be utilized with various wheelchair designs.

FIG. 9 is a cross-sectional view taken along lines 9—9 of FIG. 8.

FIG. 10 is an end elevational view taken along lines 10—10 of FIG. 8.

FIG. 11 is an end elevational view similar to FIG. 10 with the lock member in a release position.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference now to the drawings, numeral 10 of FIG. 1 shows generally the support arms of the invention attached to a wheelchair 12. The wheelchair includes a seat 13 having an overall rectangular shape with opposing side edges 14 and a back edge 15. The seat is supported by a U-shaped frame member 23 of wheelchair frame 18.

Extending upwardly from adjacent the back edge 15 is backrest 16. The backrest is supported by cross-bars 22 of the overall frame 18 with opposing ends thereof secured to upstanding frame bars 19. The frame bars are located proximate each opposing back corner 17 of the seat. Adjustment means 20 is used to attach each arm to a respective frame bar.

The invention contemplates the use of two arms which are mirror images of each other. They are juxtaposed facing each other on opposing sides of the wheelchair above the seat and adjacent the hip region of a person seated in the wheelchair. The arms comprise an elongated shaft 21 having a proximal end 24 which connects with the adjustment means. The proximal end merges into a lateral portion 26 followed by a curved portion 28. The curved portion extends into a distal segment 30 which terminates at free end 32.

The proximal end and lateral portion preferably form a continuous straight segment of the shaft. The distal segment forms a shorter straight section. The angle "a" between the longitudinal axis of the lateral portion and distal segment can range between 70° and 110°. Except for the proximal end 24, the shaft 21 is preferably covered with cushioned sleeves 34. At least part of the proximal end should be circular in cross-section.

As best seen in FIGS. 2 and 3, the arms adjustably interact with the pelvic region of a person seated in the wheelchair to form a hip constraint area 36. The area is defined as the space between the opposing arms 10, the seat area below the arms and the backrest area behind the arms.

The configuration of each arm and its universal adjustment capability permit the arms to act upon the lateral areas 38 of a patient's pelvis for the desired constraint and orientation. With particular reference to FIG. 2, the curved and lateral portions of each arm are depicted in engagement with various portions of the sub-anterior-superior iliac spine region 40 of the pelvis to securely position the patient's hips within the constraint area.

Adjustment means 20 provides the universally adjustable connection between each arm and the wheelchair frame. In the FIGS. 1–7 embodiment, its basic components are a frame attaching clamp 50 and a slide block assembly 52. Included with the slide block assembly is a transverse rod 54. The rod connects the assembly with the frame attaching clamp which, in turn, is attached to the wheelchair frame.

The clamp comprises a clamping block 56 which has an open slot 58 extending across the block width from a first end 57 to a rod opening 60. The rod opening also extends across the width of the block and includes a split sleeve 62. As shown, the sleeve adapts the round opening 60 to the hexagonal cross-section of rod 54 and allows the rod and sleeve to rotate within the opening as shown by arrows E in FIG. 2.

Adjacent the first end 57 is a threaded fastener 64 extending across the slot 58. Tightening the fastener

will close both the slot and split sleeve and secure the block to the transverse rod. Loosening the fastener will permit lateral movement of the rod, as well as the aforementioned rotational movement.

Proximate second end 66 of block 56 is bar opening 68 through which frame bar 19 extends. The bar opening extends through the thickness of the block and has a cross-sectional shape in correspondence with the cross-sectional shape of the frame bar.

Extending transverse to the bar opening and intersecting a segment 69 thereof is a collar opening 70. A corresponding collar 72 fits into the opening and is held therein by collar fastener 74. The fastener is threadably secured to the block and, when tightened, forces a portion of the collar to frictionally engage a corresponding portion of bar 19 through segment 69. When the collar fastener is loosened, the clamp (including the arm) may be moved vertically along the bar as shown in phantom in FIG. 2 and by arrows B.

The slide block assembly 52 comprises a pivot connector member 80 and an arm connector means 82. Fixed to the arm connector means by pegs 84 is pivot shaft 86. The pivot shaft extends perpendicularly from lower face 88 of connector block 90 into corresponding pivot opening 92 of the pivot connector member.

The pivot opening extends perpendicular to upper face 94 through pivot block 96. Extending transversly across the width of the pivot block is a central rod opening 98. This opening intersects pivot opening 92 and forms a rodway 101.

Pivot shaft 86 is provided with an annular notch 103 about its lower periphery which corresponds in shape to an angular segment of the transverse rod cross-section. The rodway and notch are coextensive so that the angular segment will extend through the rodway and into the notch. With the round pivot shaft 86 and annular notch 103, it can be seen that the pivot shaft can be rotated while the shaft and transverse rod are engaged.

The connector member 80 further includes a releasable securement means. This comprises an engagement opening 109 extending across the pivot shaft diameter which is coextensive with pin opening 110 of pivot block 96. A release pin 112 is provided for reciprocation within the openings. It includes an annular shoulder 113 from which extends a reduced diameter portion 114. Surrounding the reduced diameter portion is compression spring 116 which abuts between shoulder 113 and end 111 of the pin opening. The spring functions to bias the pin into the engagement opening.

When the shaft engagement opening and pivot block pin opening are in alignment, the spring 116 will move the release pin into the engagement opening. This will lock the arm connector means into a predetermined orientation. Finger grasping means, shown as ring 118, is attached to pin portion 114 for pulling the pin against the spring bias and out of the engagement opening.

Extending across the width of the pivot block 96 is rod slot 123. It extends from outer end 121 to central rod opening 98. With threaded rod fastener 124 extending across the slot, opening 98 may be enlarged to loosen frictional engagement with rod 54. As so enlarged, the pivot connector member (and adjoining arm connector means) may be moved along the longitudinal extent of the transverse rod as shown by arrows A in FIG. 3.

In a similar fashion, arm slot 125 extends across the width of connector block 90 from securement face 126 to arm opening 128. The arm opening also extends across the width of the block. Its diameter is enlarged or contracted by threaded arm fastener 129 which extends across the arm slot. Loosening the arm fastener allows axial movement of distal portion 24 of shaft 21 through the arm opening as shown by arrows C in FIG. 2. With opening 128 enlarged, the arm may also be rotated to direct the distal segment 30 in any desired angular orientation.

In operation, ring 118 will be pulled to remove release pin 112 from engagement opening 109 and allow the arms 10 to swing out into an open position as shown in phantom and by arrows D in FIG. 3. A person will then be positioned into a seated position with the trunk region firmly against backrest 16. At this point, it will be appreciated that the wheelchair may include other support means, such as trunk, neck and shoulder pads, which may be secured against the person's body.

Thereafter, the arms will be swung into a closed position to define an initial constraint area 36. The arms are locked in the closed constraint position as a result of the pin 112 entering engagement opening 109. Note that the longitudinal axis of the engagement opening will be in alignment with the longitudinal axis of the proximal and lateral portions of the arms when they are in a closed position. In this manner, the arms will be locked in the operative constraint position but, can be quickly and easily released to an open position for egress from the chair.

It will further be appreciated that the invention can be modified for attachment to a variety of wheelchair designs. Most commonly, the upstanding frame bars will be altered to include securement means for attachment to appropriate parts of an existing wheelchair frame. Typically, the bars 19' will be located behind the chair backrest. The highly versatile adjustment means will function to locate the arms in front of the backrest above the seat to define the desired hip constraint area. Also, the slide block assembly can be modified to facilitate axial rotation of the arm via a quick release means.

With reference now to FIGS. 8–11, a modified adjustment means 20' is shown comprising frame bar attaching clamp 50 and slide block assembly 52'. Included with the slide block assembly is transverse rod 54 which connects the assembly with the clamp. Note the clamp is attached to the aforementioned upstanding frame bar 19' in the same manner as before. However, the transverse rod extends outwardly therefrom to properly locate the slide block assembly whereby it can direct the arm 10 into the desired hip constraint position.

The modified slide block assembly 52' includes an arm rotation block 132 having a lower side aperture 133 for receiving and stationarily securing the block to the end section of transverse rod 54. Proximate the block midportion is axial opening 134 which extends through the block thickness perpendicular to side aperture 133. The proximal end 24 of arm 10 extends through the axial opening and freely rotates therein as shown by arrows F.

Clamped to the arm proximal end adjacent the outer face 135 of block 132 is lock member 136. The lock member is provided with an arm slot 137 that extends from a lower end 138 to an arm lock opening 139. The opening is about identical to, and coextensive with, axial opening 134 so that proximal end 24 will extend therethrough. Threaded fastener 140 extends across slot 137. When tightened, the fastener functions to draw the bifurcated parts of lower end 138 into frictional engagement with the arm proximal end.

In a clamping action similar to the above, split collar 142 encircles proximal end 24 adjacent the inner face 141 of rotation block 132. Tightening fastener 143 will clamp the collar about the proximal end. With the collar and lock member secured to the proximal end at opposing faces of block 132, arm movement along its longitudinal axis will be prevented. Of course, loosening of the collar and lock member will permit longitudinal adjustment of the arm as dictated by a patient's needs. Such loosening will also permit rotation of the arm and angular adjustment of the arm distal segment 30.

After the aforementioned semi-permanent arm adjustments have been made, a releasable locking means 145 is provided to maintain the arm in position. As best shown in FIG. 9, such means is substantially identical to the releasable securement means used with pivot connector member 80.

When the arm 10 is in a locked pelvis constraint position, engagement opening 109' of stationary arm rotation block 132 will be in alignment with pin opening 110' of lock member 136. Release pin 112' reciprocates within the openings and includes a shoulder 113'. Spring 116' encircles a reduced diameter portion of the pin and is compressed between pin opening end 111' and shoulder 113'. The spring functions to bias the pin into engagement with opening 109' unless drawn therefrom by pulling outwardly on ring 118'.

When pin 112' is withdrawn, the arm can be rotated within axial opening 134 of stationary arm rotation block 132 as shown by arrows F and G. This allows a wheelchair user to have the arms rotate from a locked constraint position shown in FIGS. 8–10, to a release position as shown by arrows G in FIG. 11.

With reference to FIG. 1, both arms are shown in a typical constraint position. In a release position, the lock member 136 would be rotated until the distal segments point up and away from interference with a patient's movement in and out of the wheelchair.

In both the FIGS. 1–7 and 8–11 embodiments, the constraint arms can be custom-fitted to each patient's size and needs in a semi-permanent manner. Yet, easy disengagement for egress is possible and further adjustments can always be made as the wheelchair user's needs change.

With the defined configuration of each arm and the above-described universal adjustment capability, it can be seen that all types of abnormal pelvic rotation, obliquity and tilt can be controlled. With patients having serious neuro-muscular deficits, such as spasticity, lack of pelvic control over a prolonged period of time could result in the development of life-threatening deformities. The present invention seeks to overcome the above and provide an effective means for pelvic control not heretofore possible.

While the invention has been described with respect to a preferred embodiment, it will be apparent to those skilled in the art that various modifications may be made without departing from the scope and spirit of the invention. Accordingly, it is to be understood that the invention is not to be limited by the specific embodiments described, but only by the scope of the appended claims.

I claim:

1. A hip control apparatus on a chair having a seat and backrest supported by a frame comprising:

a pair of arms structured to constrain the lateral areas of the pelvis of a person seated in the chair wherein each of said arms comprises an elongated shaft at least a portion of which is covered with a cushioning means, each arm including a curved portion and a distal segment that provides forward constraint of said hip and a lateral portion that provides lateral constraint of said hip; and,

each of said arms having an adjustment means for connecting each arm to opposing sides of said chair, said adjustment means comprising a frame attaching clamp interconnected with a slide block assembly with each arm being attached to a respective slide block assembly which includes a transverse rod connecting said assembly with said frame attaching clamp, said slide block assembly further including a pivot connector member with a releasable securement means for releasably locking each attached arm at a predetermined orientation and an arm connector means for connecting said attached arm to said assembly, said arm connector means having a pivot shaft extending into said pivot connector member, said shaft being engageable with said releasable securement means.

2. The apparatus of claim 1 wherein said releasable securement means includes a spring-biased pin extending from said pivot connector member into an engagement opening in said shaft.

3. The apparatus of claim 2 wherein the longitudinal axis of said engagement opening is in alignment with the longitudinal axis of said arm lateral portion.

4. The apparatus of claim 1 wherein said frame attaching clamp includes a clamping block having an open slot extending across the width of said block from a first end to a rod opening which extends through the width of said block.

5. The apparatus of claim 4 wherein said rod opening is round and includes a split sleeve having a round exterior and polygonal interior cross-sectional shape.

6. A hip control apparatus on a chair having a seat and backrest supported by a frame comprising:

a pair of arms structured to constrain the lateral areas of the pelvis of a person seated in the chair wherein each of said arms comprises an elongated shaft at least a portion of which is covered with a cushioning means, each arm including a curved portion and a distal segment that provides forward constraint of said hip and a lateral portion that provides lateral constraint of said hip; and,

an adjustment means for each of said arms for connecting each arm to opposing sides of said chair, said adjustment means comprising a frame attaching clamp interconnected with a slide block assembly with each arm being attached to a respective slide block assembly which includes a transverse rod connecting said assembly with said frame attaching clamp, said slide block assembly further including an arm rotation block secured to said transverse rod, said arm rotation block connecting an attached arm to said assembly.

7. The apparatus of claim 6 wherein each of said arms includes a proximal end and said arm rotation block includes an axial opening through which said proximal end extends.

8. The apparatus of claim 7 wherein said arm rotation block has two opposing faces, including a collar clamped to said proximal end adjacent one of said faces and a lock member clamped to said proximal end adjacent the other of said faces.

9. The apparatus of claim 8 wherein said lock member includes a releasable locking means for preventing longitudinal rotation of said attached arm.

* * * * *

United States Patent [19]

Walt n

[11] **Patent Number: 4,647,066**

[45] **Date of Patent: Mar. 3, 1987**

[54] **ORTHOPEDIC CHAIR**

[76] Inventor: **Edward J. Walton**, 39 Farber Dr., West Babylon, N.Y. 11704

[21] Appl. No.: **773,557**

[22] Filed: **Sep. 9, 1985**

[51] Int. Cl.[4] **A47C 15/00**

[52] U.S. Cl. **280/657**; 280/47.4; 297/354; 297/409; 297/DIG. 4

[58] Field of Search ..... 297/354, 355, DIG. 4, 297/409, 407; 280/647, 650, 242 WC, 289 WC, 47.38, 47.4, 657

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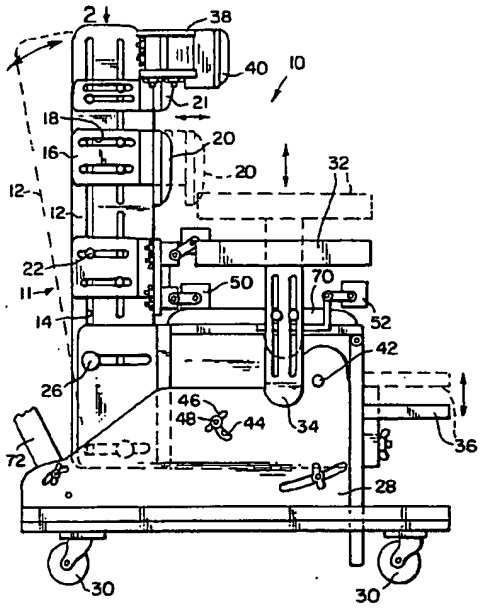
Primary Examiner—John J. Love
Assistant Examiner—Michael Mar
Attorney, Agent, or Firm—Michael I. Kroll

[57] **ABSTRACT**

An orthopedic chair for a physically impaired person is provided and consists of a seat, backrest, armrests, footrests and a tray that are readily adjustable in various attitudes to conform to the unique requirements of the physically impaired person. The chair also has casters and an adjustable rear handle so that the chair can be portable.

8 Claims, 11 Drawing Figures



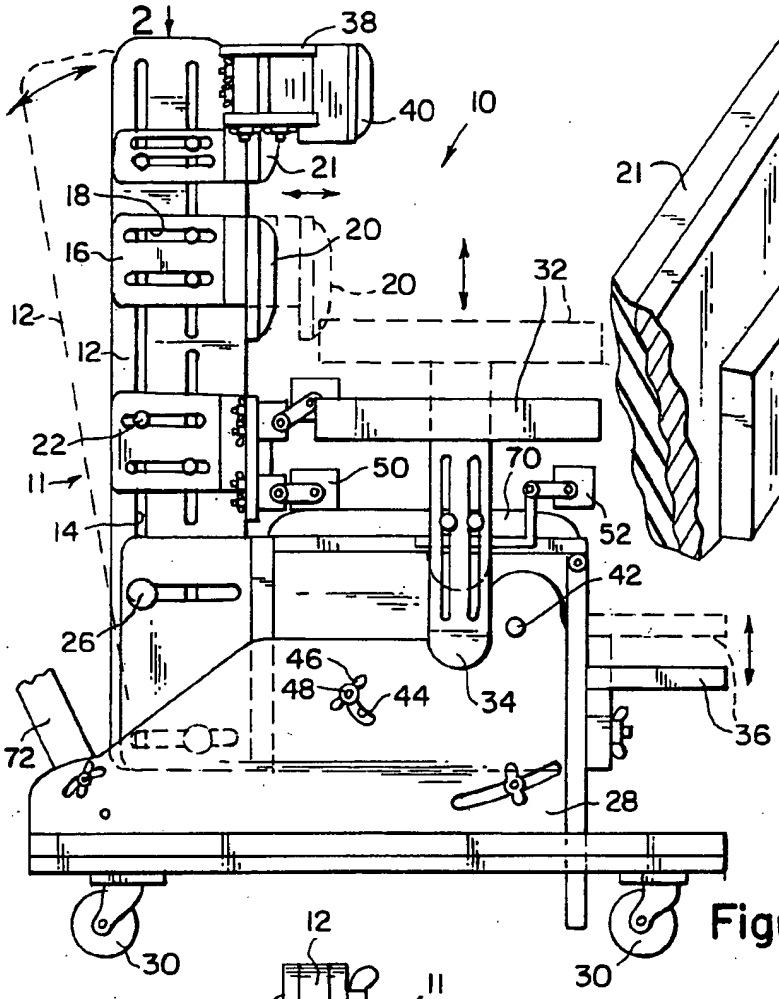
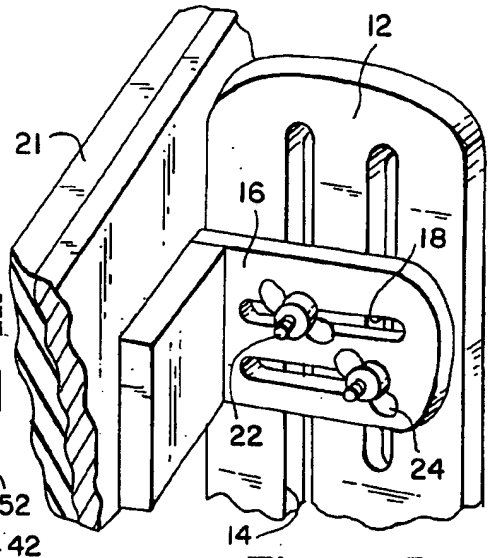


Figure 1



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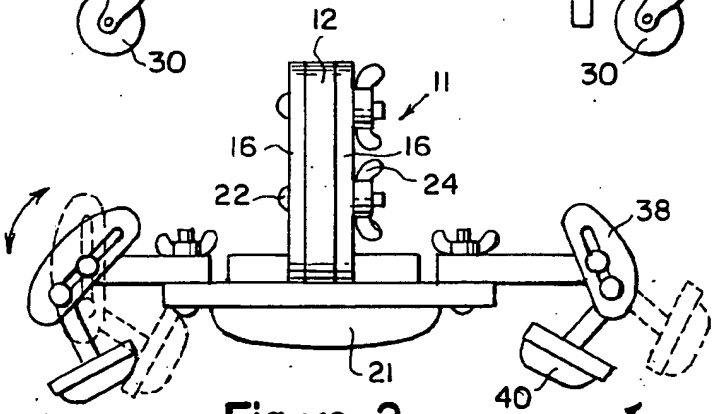

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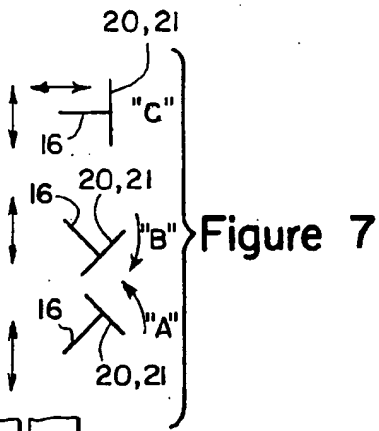

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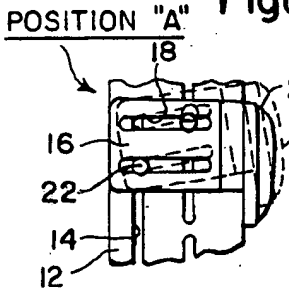

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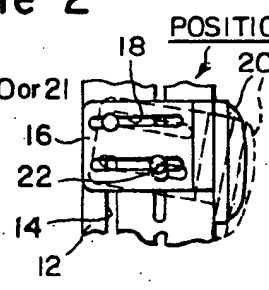

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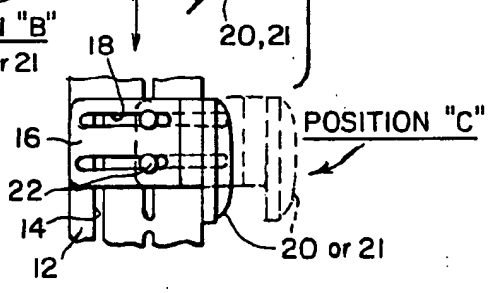

Figure 6

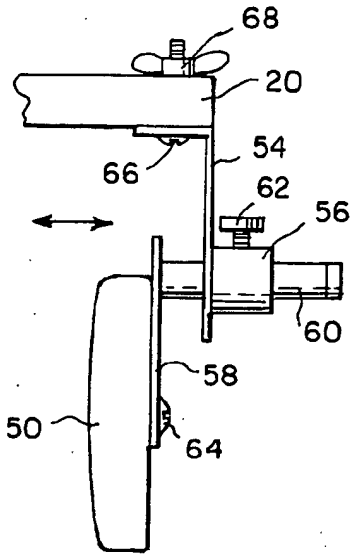

Figure 9

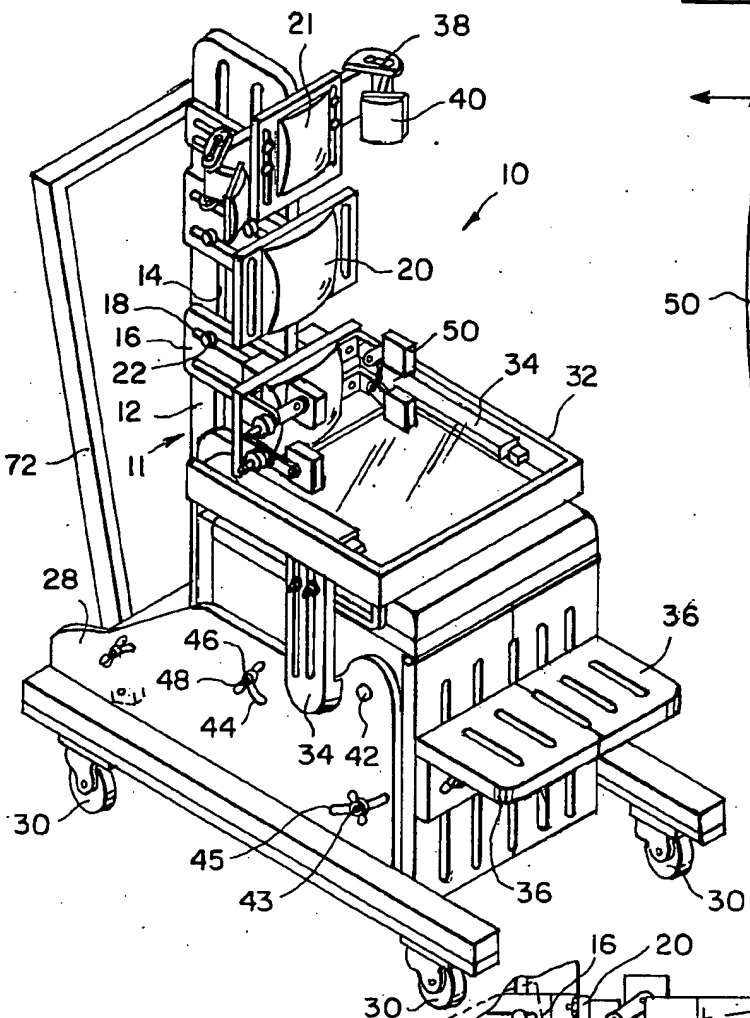

Figure 8

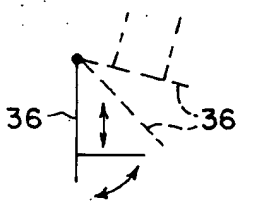

Figure 11

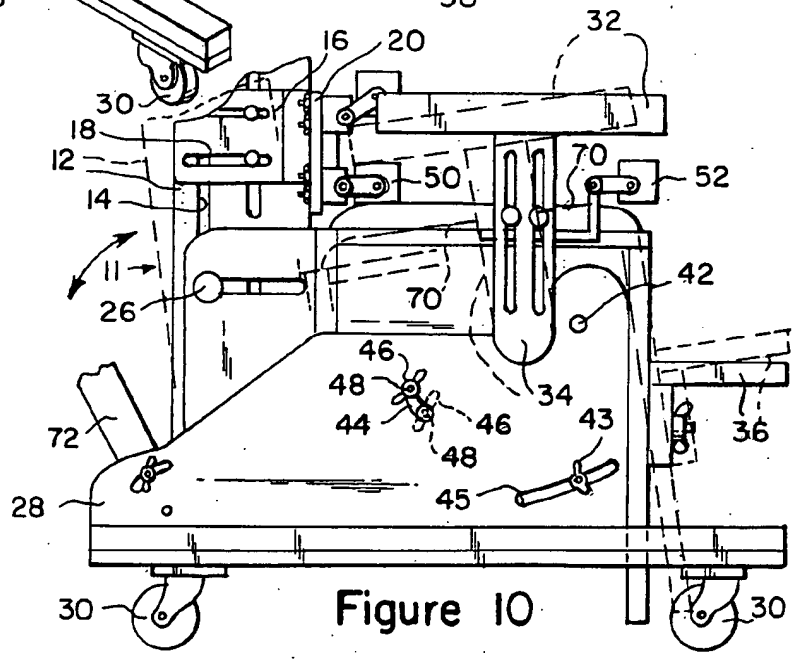

Figure 10

ORTHOPEDIC CHAIR

BACKGROUND OF THE INVENTION

1. Field of Invention

The instant invention relates generally to chairs and more specifically it relates to an orthopedic chair that is both adjustable and portable.

2. Description of the Prior Art

Numerous chairs have been provided in prior art that are adapted to adjustably conform to people sitting in the chairs. For example U.S. Pat. Nos. 3,288,525; 3,554,599; 3,877,750; 3,990,742; 4,017,118; 4,108,492; 4,367,897 and 4,437,702 all are illustrative of such prior art. While these units may be suitable for the particular purpose to which they address, they would not be suitable for the purposes of the present invention as heretofore described.

SUMMARY OF THE INVENTION

A principle object of the present invention is to provide an orthopedic chair whose seat and backrest are readily adjustable in various attitudes to conform to the unique requirements of a physically impaired person.

Another object is to provide an orthopedic chair that has a tray, armrests and footrests that are also readily adjustable in various attitudes.

An additional object is to provide an orthopedic chair that has casters and an adjustable rear handle so that the chair can be portable to be moved into different environments.

A further object is to provide an orthopedic chair that is economical in cost to manufacture.

A still further object is to provide an orthopedic chair that is simple and easy to use.

Further objects of the invention will appear as the description proceeds.

To the accomplishment of the above and related objects, this invention may be embodied in the form illustrated in the accompanying drawings, attention being called to the fact, however, that the drawings are illustrative only, and that changes may be made in the specific construction illustrated and described within the scope of the appended claims.

BRIEF DESCRIPTION OF THE DRAWING FIGURES

FIG. 1 is a side view of the invention showing various attitudes in phantom.

FIG. 2 is a top view of the backrest showing various attitudes in phantom.

FIG. 3 is a perspective view of the upper portion of the backrest.

FIGS. 4 through 6 are side views of part of the packrest in various adjustable positions in phantom.

FIG. 7 is a diagrammatic view of the various adjustable positions as shown in FIGS. 4 through 6.

FIG. 8 is a perspective view of the invention.

FIG. 9 is an enlarged top plan view of one of the side body pads.

FIG. 10 is a side view with parts broken away of the invention showing additional various attitudes in phantom.

FIG. 11 is a diagrammatic view of the various adjustable positions of one of the foot rests.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Turning now descriptively to the drawings, in which similar reference characters denote similar elements throughout the several views, FIGS. 1 through 11 illustrates an orthopedic chair 10 for a physically impaired person (not shown).

The chair 10 includes a base member 28, a padded seat 70, a backrest 11, and back pads 20. The padded seat 70 is on top of the base member 28. The backrest 11 has a substantially vertical and adjustable stantion 12 supported by the base member with bolts 26. The stantion 12 is positioned transversely to the back of the physically impaired person. The back pads 20 are adjustably affixed via braces 16 having horizontal slots 18 to the stantion 12 having vertical slots 14 by bolts 22 and wing nuts 24. The back pads 20 engage the back of the physically impaired person in various attitudes as shown in phantom.

Casters 30 are mounted to underside of the base member 28 making the chair 10 portable. A handle 72 is pivotally mounted to the rear portion of the base member 28 so that another person (not shown) may manually push the chair 10.

The seat 70 is adjustably affixed to the base member 28 by pivot pin 42 and bolt 48 extending through curved slot 44 in the base member with wing nut 46. The seat 70 can be positioned in various attitudes.

Two foot rests 36, 36 are independently adjustably affixed to front of the base member 28. Each of the foot rests can be properly adjusted to needs of the physically impaired person.

Two arm rests 34, 34 are each adjustably affixed to one side of the base member so that they can be properly adjusted to needs of the physically impaired person.

A tray 32 slidably engages with the armrests 34, 34 so that the physically impaired person can utilize the tray 32 as a table top.

A headrest pad 21 is adjustably affixed in the same manner as the back pads 20, to the upper portion of the stantion 12 to engage head of the physically impaired person in various attitudes.

A pair of side head pads 40, 40 are each adjustably affixed via adjustment member 38 to one side of the headrest pad 21. The side head pads 40, 40 can be properly adjusted to needs of the physically impaired person.

A pair of side body pads 50, 50 are each adjustably affixed to one side of each of the back pads 20. Each of the side body pads can be properly adjusted to needs of the physically impaired person.

As best seen in FIG. 9, a typical side body pad 50 is affixed by a bolt 64 to a pad brace 58 that has a transverse adjustment rod 60. The adjustment rod slides within a sleeve 56 that has a securement bolt 62. The sleeve 56 is attached transversely to one arm of an L-shaped back brace 54 with other arm of the back brace secured to the back pad 20 via bolts 66 and wing nuts 68.

A pair of side leg pads 52, 52 are each adjustably affixed to one of the arm rests 34. Each of the side leg pads can be properly adjusted to needs of the physically impaired person.

The back pad 20 and/or headrest pad 21 can tilt in an upward attitude as shown in position "A" in FIGS. 4 and 7 by off setting the bolts 22 with upper bolt to the right.

The back pad 20 and/or headrest pad 21 can tilt in a downward attitude as shown in position "B" in FIGS. 5 and 7 by off setting the bolts 22 with upper bolt to the left.

The back pad 28 and/or headrest pad 21 can move in a horizontal attitude as shown in postion "C" in FIGS. 6 and 7 by aligning the bolts 22 one above the other.

While certain novel features of this invention have been shown and described and are pointed out in the annexed claims, it will be understood that various omissions, substitutions and changes in the forms and details of the device illustrated and in its operation can be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. An orthopedic chair for a physically impaired person which comprises:

(a) a base member;

(b) a padded seat on top of said base member;

(c) a substantially vertical planar brace member secured to a rear portion of said base member and extending transversely to said padded seat, said planar brace member having a pair of vertically spaced, horizontally extending slots;

(d) a stantion extending substantially vertically from the rear portion of said base member, said stantion having a substantially rectangular configuration with opposed planar surfaces positioned transversely with respect to said padded seat and a plurality of slots arranged in two parallel rows extending along the vertical length of said stantion;

(e) a back pad having a planar brace member extending transversely therefrom and a pair of vertically spaced, horizontal slots extending through said brace member;

(f) a pair of side body pads, each of said side body pads being adjustably affixed to one side of said back pad;

(g) a headrest pad having a planar brace member extending transversely therefrom and a pair of vertically spaced, horizontal slots extending through said brace member; and

(h) releasable fastener means extending through the slots of said brace members and said stantion for adjustably securing said headrest and said back pad to said stantion and for adjustably securing said stantion to said base member.

2. An orthopedic chair as recited in claim 1, further comprising:

(a) a plurality of casters mounted to the underside of said base member making said chair portable; and

(b) a handle pivotally mounted to the rear portion of said base member so that another person may manually push said chair.

3. An orthopedic chair as recited in claim 2, wherein said seat is adjustably affixed to said base member so that said seat can be positioned in various attitudes.

4. An orthopedic chair as recited in claim 3, further comprising two foot rests that are independently adjustably affixed to the front of said base member so that each of said foot rests can be properly adjusted to the needs of said physically impaired person.

5. An orthopedic chair as recited in claim 4, further comprising a pair of armrests, each said armrest is adjustably affixed to one side of said base member so that each of said armrests can be properly adjusted to needs of said physically impaired person.

6. An orthopedic chair as recited in claim 5 further comprising a tray that slidably engages with said armrests so that said physically impaired person can utilize said tray as a table top.

7. An orthopedic chair as recited in claim 6, further comprising a pair of side head pads, each of said side head pads being adjustably affixed to one side of said headrest pad so that each of said side head pads can be properly adjusted to the needs of said physically impaired person.

8. An orthopedic chair as recited in claim 1, further comprising a pair of side leg pads, each of said side leg pads is adjustably affixed to one of said armrests so that each of said side leg pads can be properly adjusted to the needs of said physically impaired person.

* * * * *

United States Patent [19]

Mikami

[11] **Patent Number: 4,906,047**

[45] **Date f Patent: Mar. 6, 1990**

[54] **VEHICULAR SEAT**

[76] Inventor: **Tatuya Mikami, 2-13-20, Suehiro, Ichikawa-shi, Chiba-ken, Japan**

[21] Appl. No.: **231,396**

[22] Filed: **Aug. 12, 1988**

[30] **Foreign Application Priority Data**

Nov. 4, 1987 [JP] Japan 62-277388

[51] **Int. Cl.**[4] **A47C 31/00**

[52] **U.S. Cl.** **297/464**; 297/486; 297/466

[58] **Field of Search** 297/486, 466, 464, 284

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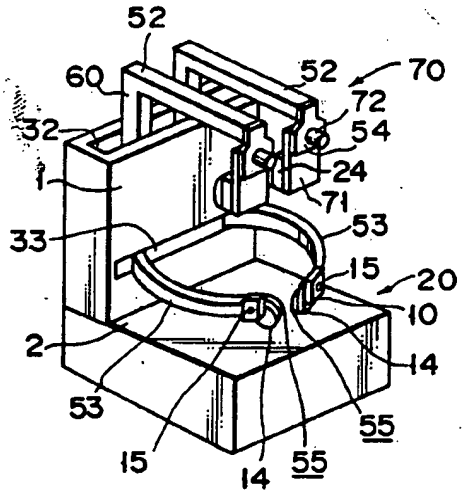
Primary Examiner—Francis K. Zugel

Attorney, Agent, or Firm—Nixon & Vanderhye

[57] **ABSTRACT**

A vehicular seat according to the present invention, which has a seat section and a seat back section connected thereto, comprises a pair of lower horizontal arms, attached to the lower portion of the seat back section and having lower support means for supporting the hipbone region of a user's body, and a pair of upper horizontal arms, protruding from the top of the seat back section and having upper support means for supporting the bladebone regions of the user's body. The lower horizontal arms are fixed after the space between them is transversely adjusted to the size of the user's body. The upper horizontal arms, which are adjustable in height relative to the lower horizontal arms, are fixed after they are transversely moved in association with the lower horizontal arms.

12 Claims, 7 Drawing Sheets



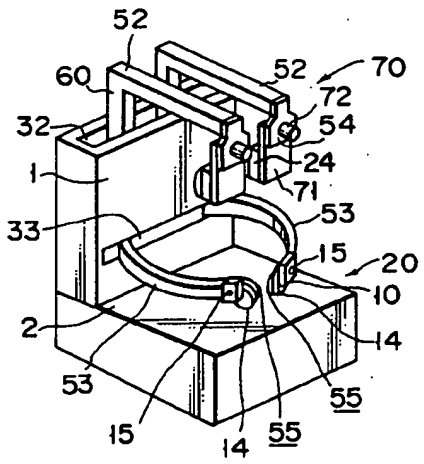


FIG. 1

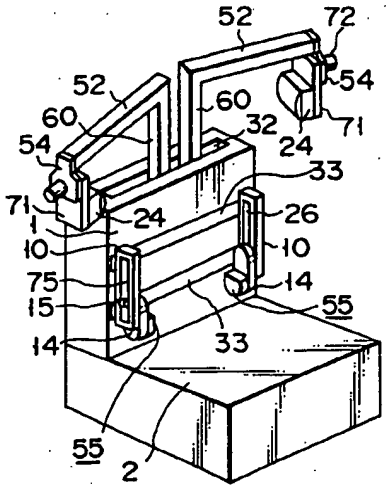


FIG. 2

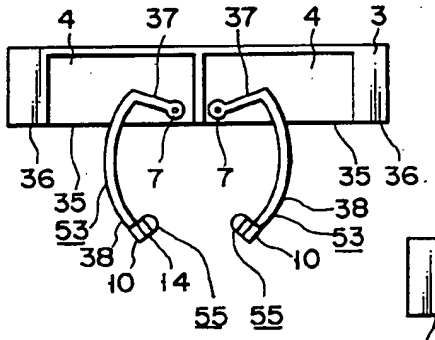
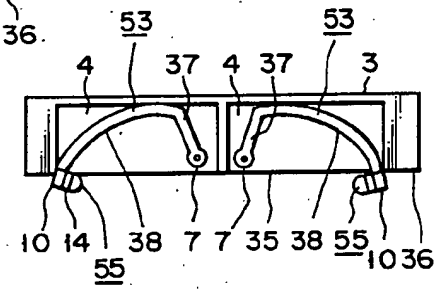


FIG. 3



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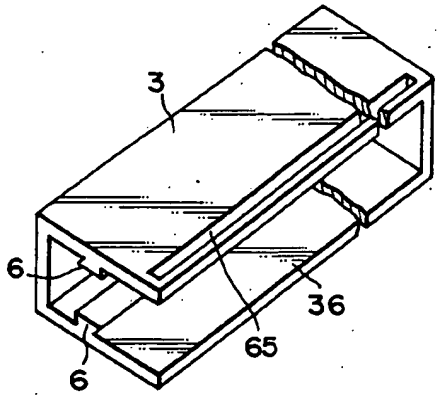


FIG. 5

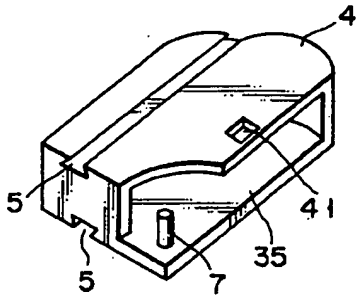
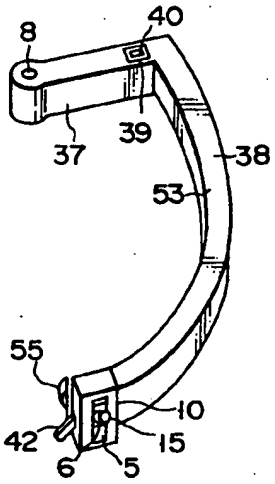


FIG. 6



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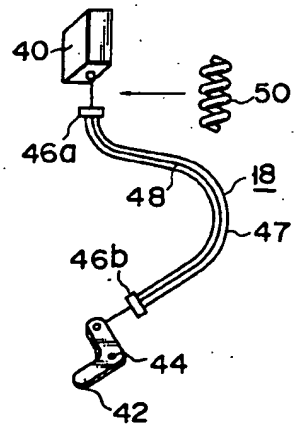

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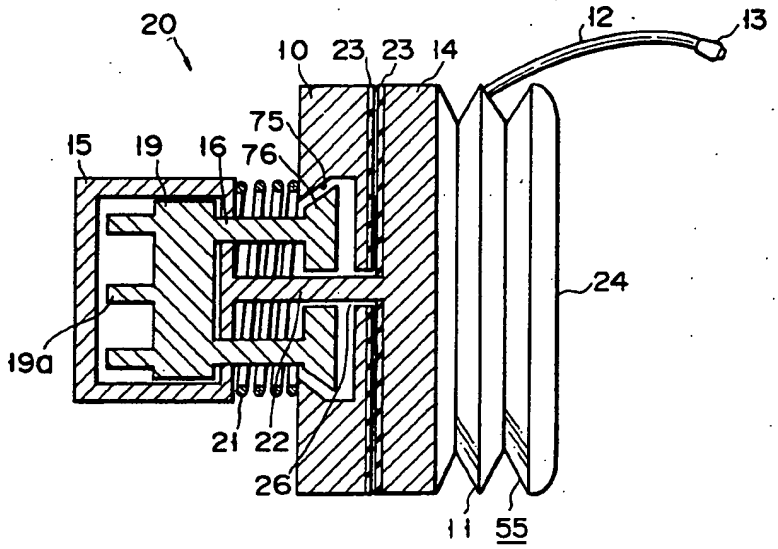
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FIG. 9

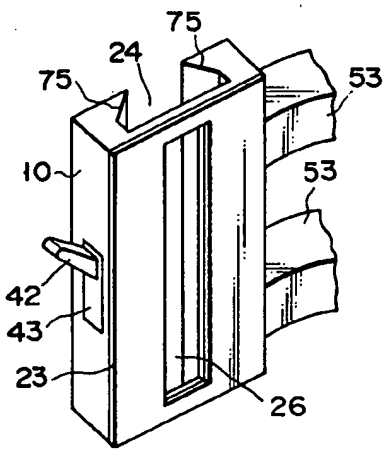
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FIG. 10

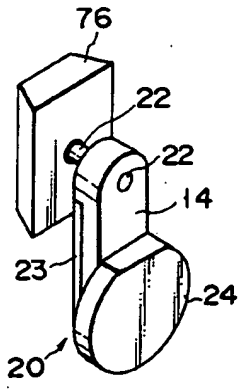
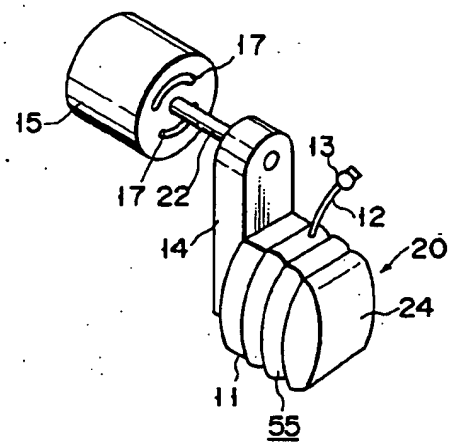


FIG. 11



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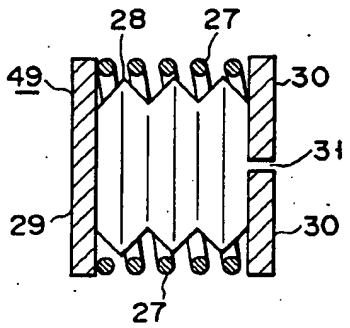


FIG. 13

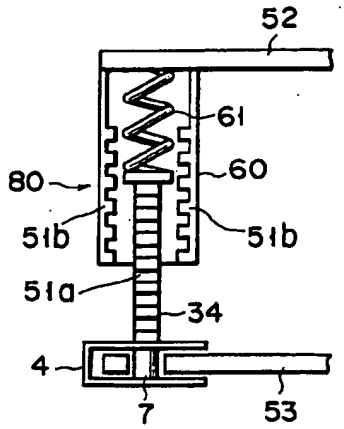
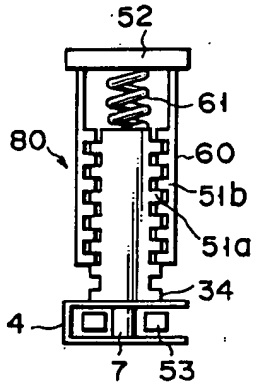


FIG. 14



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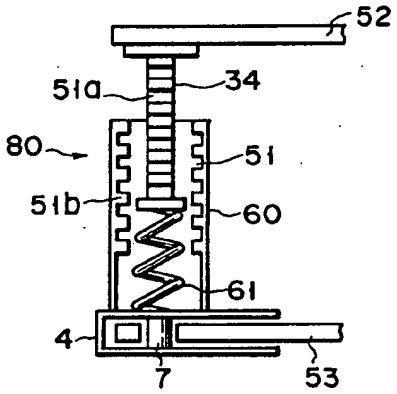


FIG. 16

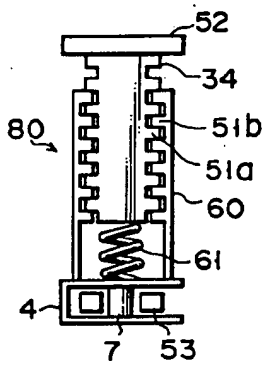
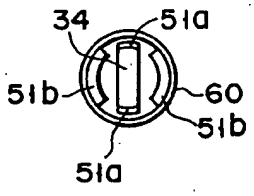


FIG. 17



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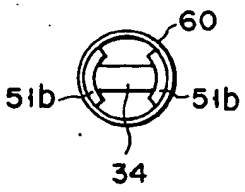


FIG. 19

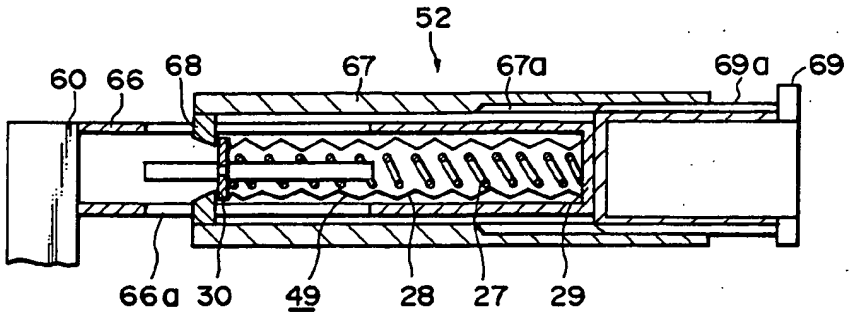
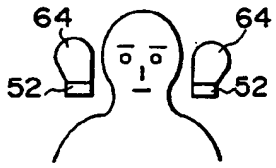


FIG. 20



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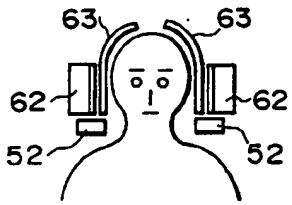
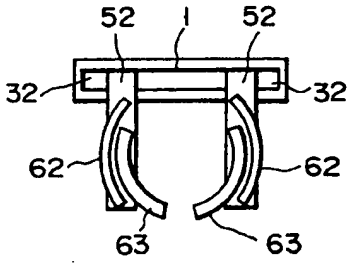


FIG. 22



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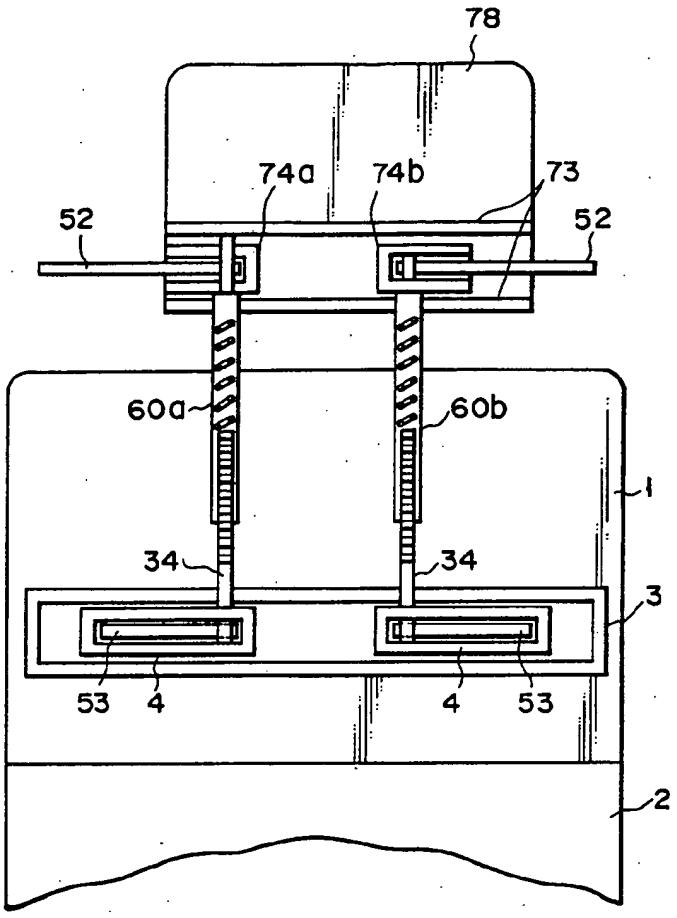

FIG. 24

VEHICULAR SEAT

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a vehicular seat.

2. Description of the Related Art

Conventionally, vehicular seats for automobiles, airplanes, etc. are provided with guards for the upper half of the user's body. These guards are intended mainly to prevent the user from receiving impulsive force on his abdominal region or chest and to prevent the user from falling forward.

Despite the use of these guards, however, the impulsive force will probably damage the soft regions of the user's body, such as the digestive and respiratory organs. Moreover, the user is not at all protected against impacts other than longitudinal ones, i.e., the user is not protected against vertical and lateral impacts.

SUMMARY OF THE INVENTION

The present invention is intended to provide a vehicular seat free from the aforementioned drawbacks to permit safe traveling.

A first object of the invention is to provide a vehicular seat in which the upper half of the user's body is supported by support means at the hipbone and bladebone regions of the body, so that the digestive and respiratory organs cannot be damaged by the seat.

A second object of the invention is to provide a vehicular seat in which the support means are fixed so as to fit the user's body, whereby the body is protected against vertical and lateral impacts as well as longitudinal ones.

A further object of the invention is to provide a vehicular seat in which an impulsive force is transmitted to the user's body through a shock absorber, thus ensuring improved safety.

In order to achieve the above objects, a vehicular seat according to the present invention is constructed as follows.

A vehicular seat, which has a seat section and a seat back section connected thereto, comprises a pair of lower horizontal arms attached to the lower portion of the seat back section so as to be swingable within a horizontal plane, the lower horizontal arms each having, at the distal end portion thereof, lower support means for supporting the hipbone region of a user's body, and a pair of upper horizontal arms protruding from the top of the seat back section so as to be swingable within a horizontal plane, the upper horizontal arms each having, at the distal end portion thereof, upper support means for supporting the bladebone regions of the user's body, the respective proximal end portions of the lower horizontal arms being transversely movable inside the seat back section, and the upper horizontal arms being transversely movable in association with the lower horizontal arms and adjustable in height relative to the lower horizontal arms.

The lower and upper horizontal arms are fixed in position after they are transversely moved and swung to fit the user's body.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view showing a vehicular seat according to a first embodiment of the present invention;

FIG. 2 is a perspective view showing a modification of the vehicular seat of FIG. 1;

FIGS. 3 and 4 are diagrams corresponding to FIGS. 1 and 2, respectively, in which lower horizontal arms are swung forward from holders, and in which the lower horizontal arms are contained in the holders, respectively;

FIGS. 5 and 6 are perspective views showing a slide guide portion and a holder, respectively;

FIG. 7 is a perspective view of the lower horizontal arm fitted with a lower support frame;

FIG. 8 is a diagram for illustrating fixing means;

FIG. 9 is a cross-sectional view of lower support means;

FIG. 10 is a perspective view of the lower support frame;

FIGS. 11 and 12 are perspective views showing a slider and other components surrounding the same;

FIG. 13 is a longitudinal sectional view of a shock absorber;

FIGS. 14 and 15 and FIGS. 16 and 17 are diagrams for illustrating an open state and a connected state, respectively, of coupling means;

FIGS. 18 and 19 are cross-sectional views illustrating the open and connected states of the coupling means shown in FIGS. 14 to 17;

FIG. 20 is a longitudinal sectional view of an upper horizontal arm;

FIG. 21 is a diagram showing upper horizontal arms fitted individually with side headrests;

FIGS. 22 and 23 are a front view and a plan view, respectively, showing upper horizontal arms fitted with a helmet; and

FIG. 24 is a diagram for illustrating a vehicular seat according to another embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 shows a vehicular seat in which seat back section 1, in the form of a rectangular tube, is connected to seat section 2. A pair of lower horizontal arms 53 are attached to the lower portion of back section 1 so as to be swingable and movable from side to side. Arms 53 serve to support the hipbone region of a user's body. Lower support means 20 is connected to the extreme end of each arm 53. A pair of upper horizontal arms 52 project from upper opening 32 of back section 1, and extend horizontally. Arms 52 serve to support the bladebone regions of the body. Upper support means 70 is connected to the extreme end of each arm 52. Upper arms 52, which are associated with lower arms 53 by means of coupling means (mentioned later), are movable from side to side, and also rockable. Further, the height of arms 52 above arms 53 is adjustable.

Opening 33 is bored through the lower front face of seat back section 3. Slide guide portion 3 with a U-shaped cross section is fixed facing this opening. As shown in FIG. 5 (illustrating only the right-hand side of portion 3), guide portion 3 has opening 36. A pair of dovetail ridges 6 are formed individually on the upper and lower inside surfaces of guide portion 3. Holders 4 with a U-shaped cross section, as shown in FIG. 6, are fitted in guide portion 3 for crosswise sliding action. A pair of dovetail grooves 5 are formed individually on the upper and lower inside surfaces of each holder 4. Slide slit 65 is bored through the top wall of slide guide portion 3. Base shaft 34 (mentioned later) protruding

from the top wall of holder 4 is guided along slit 65. Pivot pin 7 for pivotally supporting each lower horizontal arm 53 is disposed inside opening 35 of each corresponding holder 4. As shown in FIG. 7, each lower arm 53 is composed of straight portion 37 and hollow curved portion 38 connected to each other. Hole 8 is bored through the proximal end portion of straight portion 37. Pin 7 is adapted to be fitted in hole 8. Lower support frame 10 (mentioned later) is connected to the distal end portion of curved portion 38. Thus, lower horizontal arm 53 can be fitted in holder 4, as shown in FIG. 4. As shown in FIG. 8, fixing means 18, which is adapted to be contained in each lower arm 53, includes pipe 47 having fixing portions 46*a* and 46*b* at the two opposite ends thereof, wire 48 passed through pipe 47, lever 42 connected to one end of wire 48, piece 40 connected to the other end wire 48, and compression spring 50 interposed between piece 40 and fixing portion 46*a*. A friction portion is formed on the top face of piece 40. Piece 40 and spring 50 are housed in retaining hole 39 (FIG. 7) formed in straight portion 37, and fixing portion 46*a* is fixed at the lower portion of hole 39. Pipe 47 and wire 48, which is connected to piece 40, are passed through curved portion 38, and fixing portion 46*b* is fixed inside lower support frame 10. The other end of wire 48 is connected to one end of lever 42, which is pivotally mounted on shaft 44 fixed to frame 10. As shown in FIG. 10, the other end of lever 42 projects from lever aperture 43 of frame 10. Gate hole 41 (FIG. 6) for piece 40 is bored through the top wall of holder 4. When lower horizontal arm 53 is swung to its working position, as shown in FIG. 3, holes 39 and 41 align with each other, so that piece 40 projects from hole 41 and is pressed against the underside of the top wall of slide guide portion 3 to be fixed thereby. In this case, a friction portion is also formed on the lower surface of the top wall of guide portion 3, so that the position of arm 53 can be securely fixed. FIGS. 2 and 4 show a state in which upper and lower horizontal arms 52 and 53 of FIGS. 1 and 3 are swung open.

Referring now to FIGS. 9 to 13, lower support means 20 will be described in detail. It is composed of lower support frame 10 attached to the distal end portion of lower horizontal arm 53, slider 14 guided for vertical motion by frame 10, space adjuster 55 attached to slider 14, and bumper 24 attached to adjuster 55. In this example, slider 14 is also swingable. In FIG. 11, space adjuster 55 is omitted.

Lower support frame 10, which is in the form of a rectangular block, has dovetail groove 75 on one side thereof, friction member 23 on the other side surface, and a slot 26 in the center, as shown in FIG. 10. Support frame 10 of FIG. 10 is fitted with a pair of lower horizontal arms 53 arranged vertically, as in the case of the arrangement shown in FIG. 2. Shaft 22, which is to be passed through slot 26, protrudes from one end of slider 14 which is in the form of a plate. Cylindrical knob 15 is fixed to an end of shaft 22. Another friction member 23 is attached to that surface of slider 14 from which shaft 22 protrudes. Disk 19 is contained in knob 15, and three legs 19*a* are arranged at regular intervals of 120° on the disk. As shown in FIG. 12, two arcuate slots are bored in the bottom face of knob 15. Dovetail projection 76, which is adapted to engage dovetail groove 75, is coupled to disk 19 by means of two connecting shafts 16 which penetrate slots 17, individually. Compression spring 21 is provided between knob 15 and support frame 10. Meanwhile, air bag 11, for use as spacer adjuster 55, and bumper 24 are arranged on the other end side of slider 14. Air tube 12 with hand pump 13 is connected to air bag 11 so that the amount of air can be adjusted by means of tube 12. In this case, shock absorber 49, which functions to damp impulsive compressive force, may be interposed between slider 14 and adjuster 55, as shown in FIG. 13. In absorber 49, bellows 28 is disposed between fixed plate 29 and vent plate 30 having vent hole 31 in the center, and is bonded thereto at either end. Bellows 28 is surrounded by compression spring 27 which is fixed, at either end thereof, to plates 29 and 30.

With this arrangement, slider 14 is normally pressed against support frame 10 so that it is prevented from moving by friction members 23 which face each other, as shown in FIG. 9. When knob 15 is depressed against the urging force of compression spring 21 so that friction members 23 are disengaged from each other, slider 14 is allowed to move up and down, whereby space adjuster 55 and bumper 24 can be brought to their desired positions. In this example, adjuster 55 and bumper 24 can be rotated within a range of about 180° around shaft 22 by turning knob 15. Thus, the positions of adjuster 55 and bumper 24 can be adjusted over a wide angular range.

Referring now to FIGS. 14 to 19, the connection between upper horizontal arms 52 and holder 4 fitted with lower horizontal arms 53 will be described.

In FIGS. 14 and 15, cylindrical support shaft 60 protrudes downward from upper horizontal arm 52, and base shaft 34, which is adapted to be fitted in shaft 60, protrudes upward from holder 4. An internal thread formed on the inner surface of shaft 60 is axially cut off for opposite angular ranges of 90°, thus constituting female screws 51*b* as one component of coupling means 80. Base shaft 34 is in the form of a plate which is obtained by cutting off two opposite sides of a round rod having an external thread mating with female screws 51*b*. Thus, male screws 51*a*, which constitute the other component of coupling means 80, are formed individually on the two opposite edge portions of shaft 34. Compression spring 61 is interposed between shaft 34 and upper horizontal arm 52. In the state of FIG. 14 in which upper arm 52 is laterally swung open, screws 51*a* and 51*b* are disengaged, as shown in FIG. 18, so that arm 52 is forced up by spring 61. In use, arm 52 is depressed from this position to a desired height, against the urging force of spring 61 and swung forward. Thereupon, screws 51*a* and 51*b* engage one another, as shown in FIG. 19, thereby adjusting arm 52 to the desired height, as shown in FIG. 15. Upper horizontal arm 52 can also be fixed in a predetermined angular position by fixing means similar to fixing means 18.

The same effect can be obtained if the configurations of base shaft 34 and support shaft 60 may be replaced with each other so that compression spring 61 is interposed between shaft 60 and holder 4, as shown in FIGS. 16 and 17.

Lower horizontal arm 53 extends transversely in FIGS. 14 and 16, while it extends longitudinally in FIGS. 15 and 17. Arms 53 can swing independently of upper horizontal arms 52.

Referring now to FIG. 20, the construction of upper horizontal arm 52 will be described. Arm 52 is composed of inner cylinder 66 connected to support shaft 60, outer cylinder 67 slidably fitted in cylinder 66, and screw member 69 for use as space adjuster 55. Screw member 69 serves to adjust the position of cylinder 67

relative to cylinder 66, that is, to adjust the space between support shaft 60 and support means attached to cylinder 67. Shock absorber 49 is contained in inner cylinder 66. It has the same construction as the one mentioned before, except that compression spring 27 is disposed inside bellows 28. A plurality of axial slits 66a are cut in the peripheral surface of cylinder 66. A plurality of claws 68 protrudes inward from one end portion of outer cylinder 67 so that they abut against vent plate 30 of shock absorber 49 through slits 66a. Female screw 67a is provided at the other end side of cylinder 67. Screw member 69 has male screw 69a which mates with screw 67a. The end face of member 69 abuts against the end of inner cylinder 66. Thus, the space between support shaft 60 and upper support means 70 can be adjusted to the size of the user's body by turning screw member 69.

Referring now to FIGS. 1 and 2, upper support means 70 will be described in detail. It includes upper support member 54, rocker 71 rockably mounted thereon, and bumper 24 attached to the lower end portion of the rocker. A shaft is attached to the upper end portion of rocker 71 so as to penetrate support member 54, and knob 72 is fixed to this shaft. Rocker 71 can be rotated within a range of about 180°, with respect to member 54, through the medium of a rotating mechanism similar to the one shown in FIG. 9, by operating knob 72, and can thus be fixed in position. As head support means 81, side headrests 64 may be mounted on the top of upper horizontal arms 52, as shown in FIG. 21. Alternatively, a helmet composed of fixed portions 62 and rocking portions 63, as shown in FIGS. 22 and 23, or an integral helmet may be provided as support means 81.

As shown in FIG. 2, moreover, two sets of slide guide portions 3 and lower horizontal arms 53 are arranged at the lower portion of seat back section 1 so that one lower support frame 10 is attached to the respective distal end portions of each vertical pair of arms 53. Also in this case, each lower horizontal arm 53 can be fixed in a predetermined angular position by fixing means similar to fixing means 18.

The user sits on seat section 2 and brings his back close to seat back section 1. In this state, lower horizontal arms 53 are swung forward, and the space between them is adjusted, as shown in FIGS. 1 and 3. Thereafter, levers 42 of arm fixing means 18 are operated to fix lower arms 53. Then, knobs 15 of lower support means 20 are operated to adjust the vertical positions of sliders 14. Also, the amount of air in air bags 11, for use as space adjusters 55, is adjusted so that the user's hipbone region can be supported by means of arms 53.

Subsequently, in the state of FIG. 2 where upper horizontal arms 52 are parted right and left, arms 52 are forced down to a desired height, and then swung forward. Thus, arms 52 are positioned with respect to elevation, and then fixed. Thereafter, screw members 69, for use as space adjusters 55, are operated, and knobs 72 are operated so that the user's bladebone regions can be supported by means of bumpers 24.

Thus, even when the user meets with a head-on collision, his body is supported by the bladebone and hipbone regions, so that the soft regions of the body, such as the abdominal region and the breast, cannot be subjected to any impact. Since the individual arms are fixed, moreover, the body is protected against rolling and other impacts, mainly by upper and lower horizontal arms 52 and 53. Also, the impacts on the user's body can be damped by the action of shock absorbers 49 attached individually to upper and lower horizontal arms 52, 53. Furthermore, head support means 81 on upper horizontal arms 52 serves to protect the user's neck.

Referring now to FIG. 24, another embodiment of the present invention will be described.

In this embodiment, rear headrest 78 is provided above seat back section 1. Slide guide portion 73 similar to slide guide portion 3 is disposed under headrest 78, and holders 74a and 74b similar to holders 4 are arranged inside guide portion 73. Left-hand holder 74a is fixed to guide portion 73 and coupled with left-hand support shaft 60a. On the other hand, right-hand holder 74b is connected to right-hand support shaft 60b so that it can transversely slide together with shaft 60b inside guide portion 73. Thus, headrest 78 and holder 74b can transversely move together with left- and righthand support shafts 60a and 60b, respectively. Also, the position of headrest 78 can be adjusted to the vertical position of the user's head. With respect to other components, including upper and lower horizontal arms 52 and 53 and upper and lower support means 70 and 20, the second embodiment is constructed in the same manner as the first embodiment.

The second embodiment can produce the same effects as the first embodiment.

What is claimed is:

1. A vehicular seat which has a seat section and a seat back section connected thereto, comprising:

a pair of lower horizontal arms attached to the lower portion of the seat back section so as to be swingable within a horizontal plane, said lower horizontal arms each having, at the distal end portion thereof, lower support means for supporting the hipbone region of a user's body, and wherein each of said lower horizontal arms is fixed in a predetermined angular position by means of first fixing means;

a pair of upper horizontal arms protruding from the top of the seat back section so as to be swingable within a horizontal plane, said upper horizontal arms each having, at the distal end portion thereof, upper support means for supporting the bladebone regions of the user's body,

and wherein each of said upper horizontal arms is fixed in a predetermined angular position by means of second fixing means,

the respective proximal end portions of said lower horizontal arms being transversely movable inside the seat back section, and

said upper horizontal arms being transversely movable in association with the lower horizontal arms and adjustable in height relative to the lower horizontal arms.

2. The seat according to claim 1, wherein a frontopen slide guide portion is disposed in the lower portion of the inside of the seat back section, and the respective proximal end portions of said pair of lower horizontal arms are pivotally mounted on holders adapted to be transversely guided inside the slide guide portion.

3. The seat according to claim 2, wherein said lower support means includes a lower support frame attached to the distal end portion of each said lower horizontal arm, a slider held by the lower support frame so as to be vertically adjustable in position, a space adjuster attached to the slider, and a bumper attached to the space adjuster.

4. The seat according to claim 3, wherein a shock absorber for damping impulsive compressive force is interposed between said spacer adjuster and said slider.

5. The seat according to claim 4, wherein said space adjuster is an air bag.

6. The seat according to claim 2, which further comprises a base shaft protruding upward from, each said holder and a support shaft protruding downward from the proximal end portion of each said upper horizontal arm, and wherein each said upper horizontal arm is urged upward to move away from each corresponding holder, and can be adjusted in height relative to the holder by means of coupling means.

7. The seat according to claim 6, wherein each said upper horizontal arm includes an inner cylinder containing the shock absorber therein, an outer cylinder fitted in the inner cylinder and having a claw to engage a vent plate of the shock absorber, and a space adjuster for adjusting the position of the outer cylinder relative to the inner cylinder.

8. The seat according to claim 7, wherein said upper support means is situated below the outer cylinder.

9. The seat according to claim 8, wherein said upper support means includes an upper support member and a rocker having a bumper attached to the support member.

10. The seat according to claim 9, wherein said space adjuster is composed of the outer cylinder 67 having a female screw at an end portion thereof and a screw member mating with the screw.

11. The seat according to claim 10, wherein each said upper horizontal arm is further provided with head support means.

12. The seat according to claim 1, which further comprises another pair of lower horizontal arms adjoining said pair of lower horizontal arms, one said lower support means being attached to the distal ends of each vertical pair of lower horizontal arms, and wherein each said lower horizontal arm is fixed in a predetermined angular position by means of fixing means.

* * * * *

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United States Patent [19]

Snijders

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[45] Date of Patent: Sep. 5, 1995

[54] **CHAIR FOR DISABLED PERSONS**

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[73] Assignee: **B.V. Linido**, TP Pijnacker, Netherlands

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§ 371 Date: **Oct. 30, 1992**

§ 102(e) Date: **Oct. 30, 1992**

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PCT Pub. Date: **Nov. 14, 1991**

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[51] **Int. Cl.**[6] **A47C 1/024**

[52] **U.S. Cl.** **297/284.3**; 297/486; 297/487; 297/464

[58] **Field of Search** ..... 297/284 B, 130, 464, 297/466, 487, 488, 486

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Primary Examiner—Michael F. Trettel

Attorney, Agent, or Firm—Beveridge, DeGrandi, Weilacher & Young

[57] **ABSTRACT**

A chair for disabled persons has a supporting frame, a seat adjustably connected to the supporting frame by a hinge, and a back adjustably connected by a hinge to the rear of the seat. The seat has a front section which lies beneath and supports the upper legs of an occupant, and a rear section which lies beneath and supports the pelvis of an occupant. The front and rear sections can be fixed and adjusted independently of each other due to a hinge which is parallel to the hinge at the rear of the seat.

13 Claims, 4 Drawing Sheets

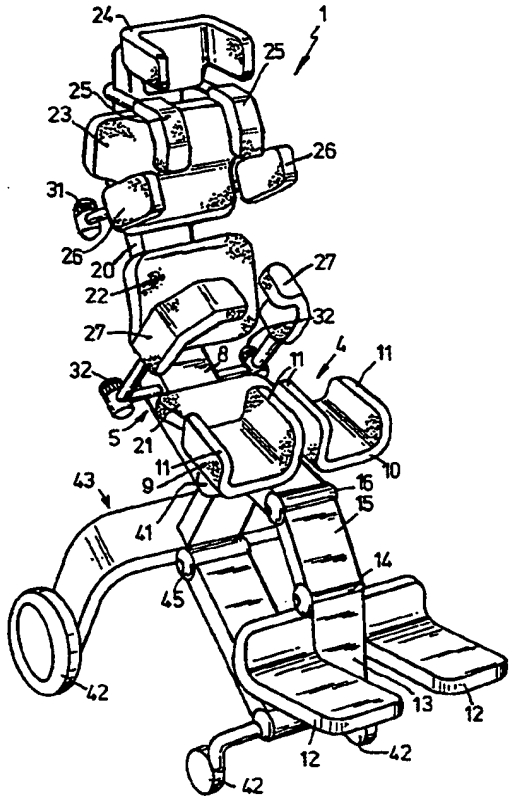

FIG. 1

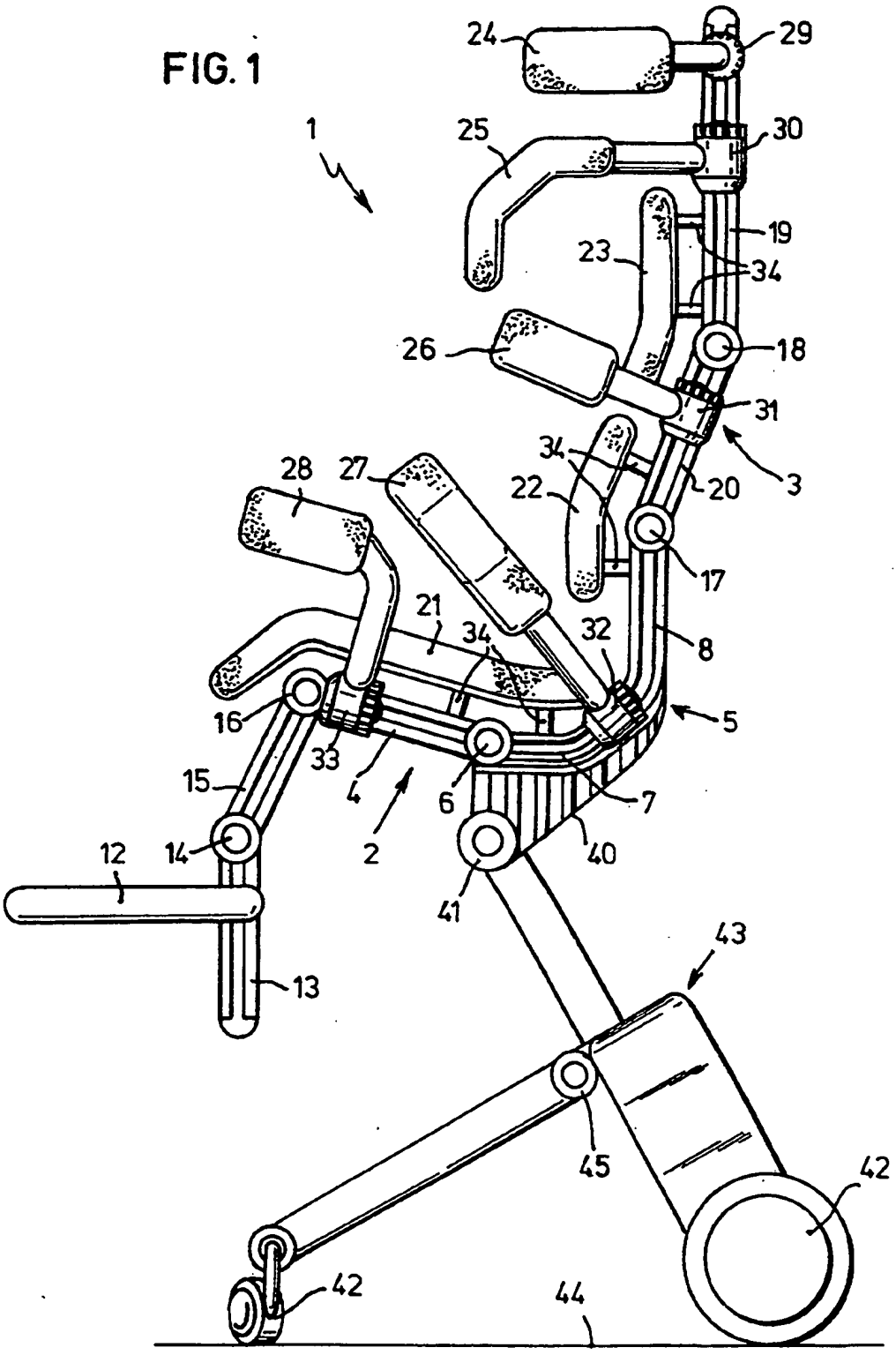
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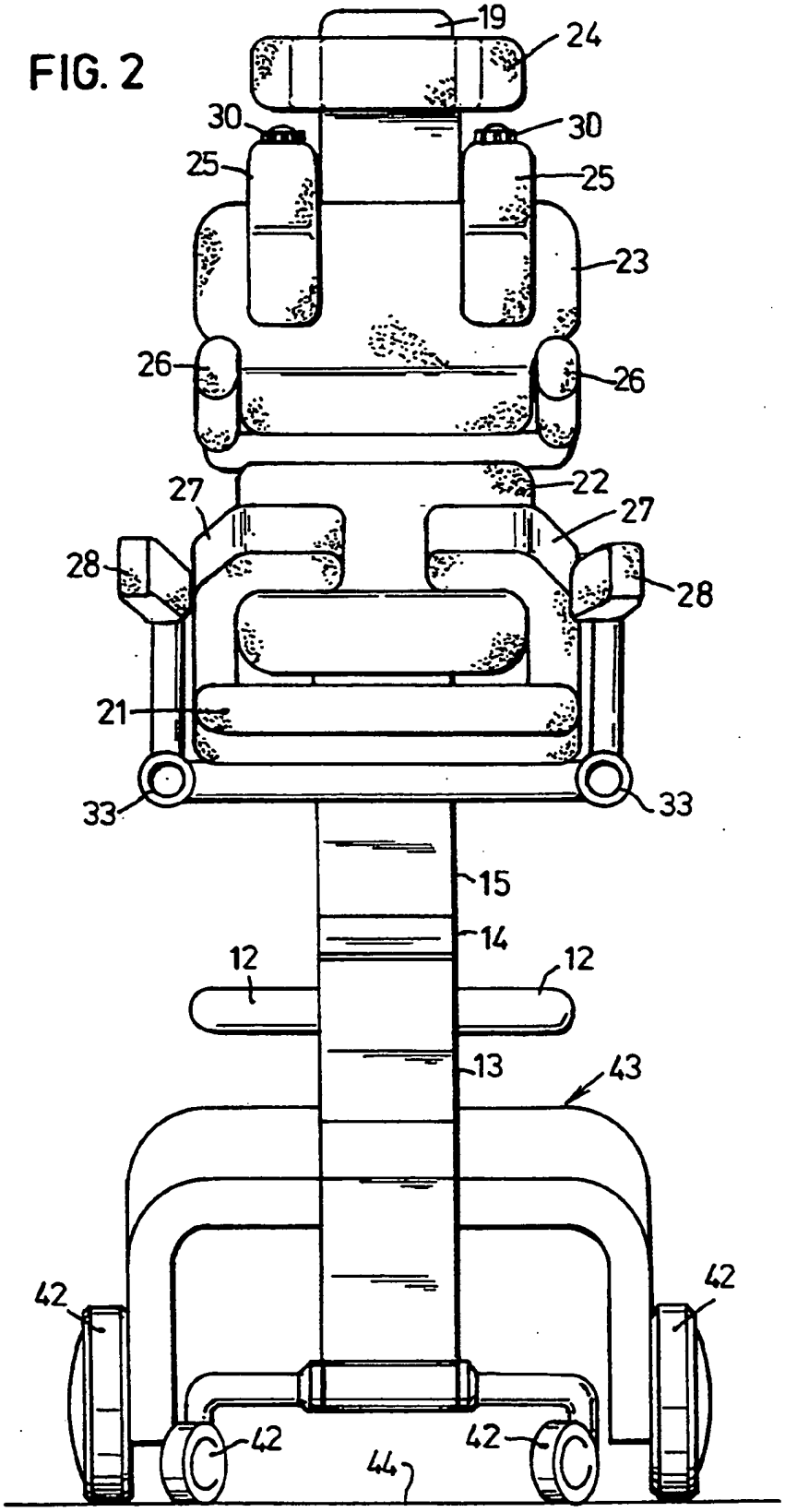
FIG. 2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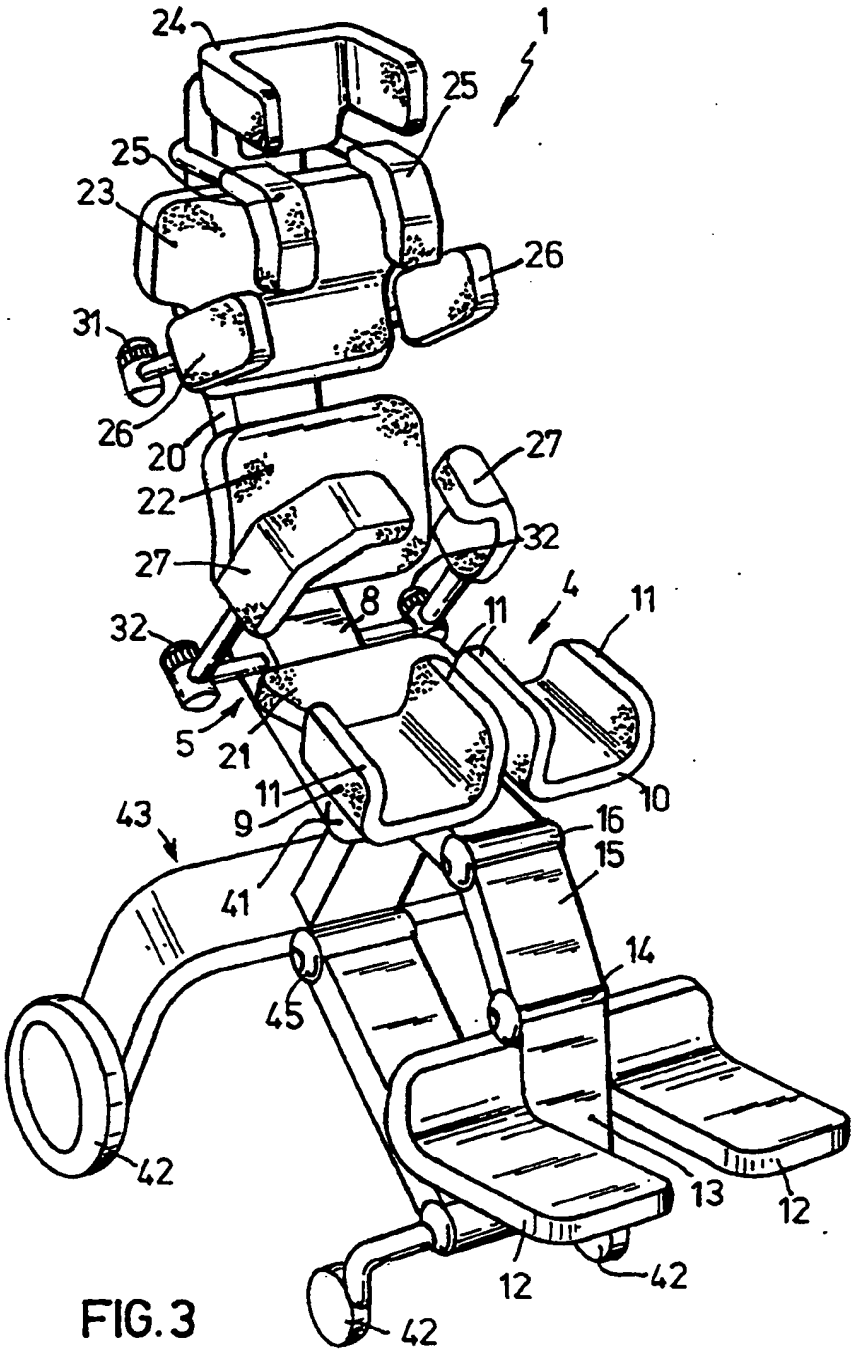
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FIG. 3

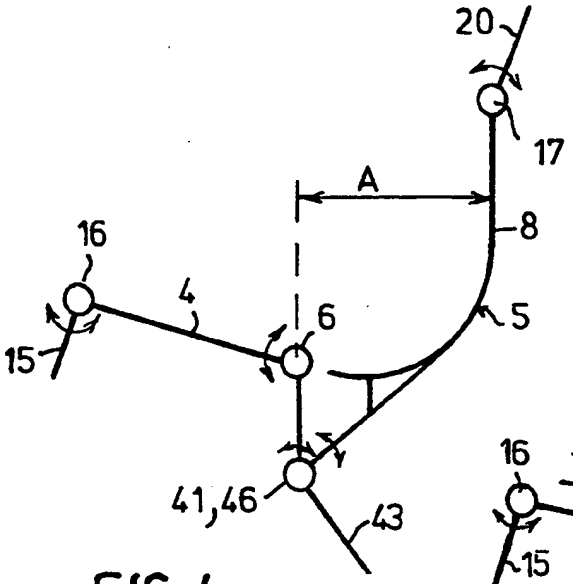

FIG. 4

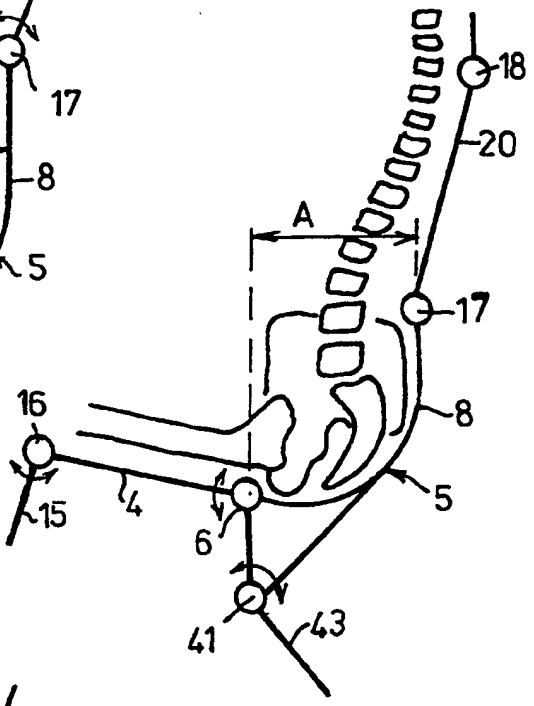

FIG. 4a

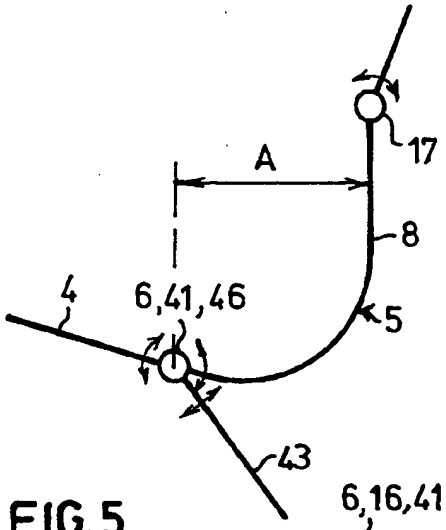

FIG. 5

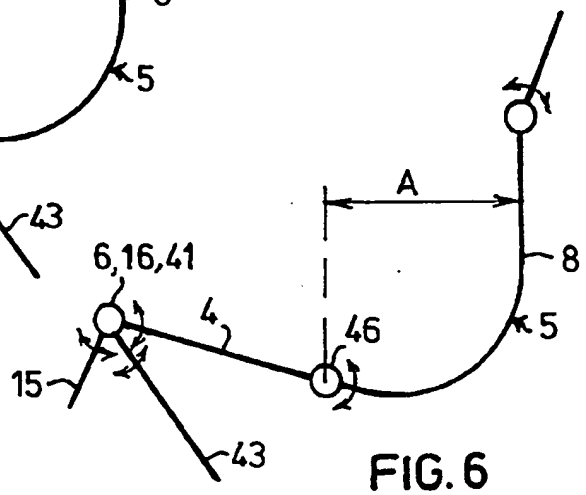

FIG. 6

CHAIR FOR DISABLED PERSONS

The present invention relates to a chair for the disabled, comprising at least a seat, a back and a supporting frame, the seat being adjustably connected to the back by means of a hinge at the rear end of the seat, and the supporting frame being adjustably connected to the seat by means of a hinge, the axes of the said hinges being parallel to one another.

Seats of this type are generally known. When used, the seat usually assumes a substantially horizontal position, whereas the back, being hingably connected to a rear end of the seat, will form an obtuse angle to the seat. The hinge connecting the supporting frame to the seat and the back has been positioned in line with the hinge connecting the back and the seat. If no further measures are taken, the weight of the reclined upper part of the body will cause the pelvis to shift forward and to be tilted backwards, on account of which the upper part of the body is substantially supported by the coccyx and no longer by the tuberosities of the ischia. This sacral sitting position will moreover result in an undue load on the spinal column, and is even more likely to occur if the seat is forwardly declined. Such an oblique positioning of the seat and back, however, may be desirable with spastics in order to suppress flexion spasms or stretching spasms, for which purpose the angle confined by the upper legs and the back should be considerably larger or smaller than 90°, e.g. 120° or 60°, respectively. It is known to fix the pelvis in its position by means of lap belts or abduction blocks. However, these do not establish a desirable sitting position, i.e. a position in which the upper part of the body is substantially supported by the tuberosities of the ischia, as a reclined back tends to tilt the pelvis backwards, and an obliquely adjusted seat yields a support of the upper part of the body substantially by the lap belts and/or the abduction blocks. Apart from that, a reclined back forces the disabled into a reclined and therefore passive posture.

The present invention aims to remove these drawbacks and for that purpose according to the invention a chair for the disabled is provided, said chair being characterized in that the seat is divided into a front section destined to support the upper legs, and a rear section destined to support the pelvis, and in that the front and the rear section can each be fixed and adjusted, independently of one another, by means of a hinge that is parallel to the hinge at the rear end of the seat.

After the pelvic section of the seat has been adjusted in order to obtain the desired sitting position, it is thus possible that the desired hip angle can be adjusted independently thereof by adjusting the upper leg section of the seat.

According to a further embodiment of the invention, the section of the seat destined for supporting the pelvis comprises a rear portion extending up to a point at level with the lumbar region, preferably at the top edge of the sacrum of the lumbar spinal column, at which position the hinge is located for adjustably and fixedly connecting the back to the seat. This allows for adjustment of the back without affecting the desired positioning of the pelvis and thus the desired sitting position, while moreover the rear portion of the pelvic section of the seat provides further support for the pelvis.

Further advantages and other characteristics of the chair for the disabled according to the invention will

appear from the following description of a number of embodiments, in which reference is made to the drawing in which:

FIG. 1 shows a side view of a first embodiment of the chair for the disabled according to the invention;

FIG. 2 shows a front view of the chair for the disabled according to FIG. 1;

FIG. 3 shows a view, in perspective, of a second embodiment of a chair for the disabled according to the invention;

FIG. 4 shows a schematic side view of a first variant of the chair for the disabled according to FIG. 1;

FIG. 4*a*, for comparison's sake, shows a schematic side view of the chair according to FIG. 1;

FIG. 5 shows a schematic side view of a second variant of the chair for the disabled according to FIG. 1; and

FIG. 6 shows a schematic side view of a third variant of the chair for the disabled according to FIG. 1.

FIG. 1 shows a first embodiment of the chair for the disabled according to the invention. The chair 1 comprises a seat 2, a back 3 and a supporting frame 43. The seat 2 comprises a section 4 destined to support the upper legs and a section 5 destined to support the pelvis. The upper legs section 4 and the pelvic section 5 are hingably interconnected by means of a hinge 6. The pelvic section 5 of the seat 2 comprises a substantially horizontal foremost section 7 and a substantially vertical rearmost section 8 connected thereto, both parts having been devised in a manner suitable for supporting the pelvis by means of support faces 21 and 22 which will be described hereinafter. When the seat is being used, the tuberosities of the ischia are therefore supported by the pelvic section 5, and particularly the foremost section 7 thereof. The pelvic section 5 is mounted on a supporting frame 43 provided with wheels 42 by means of a connecting piece 40 and a hinge 41. The hinge 41 allows separate adjustment of the pelvic section 5, preferably to such an extent that the foremost section 7 defines a small angle, preferably approx. 5° to the horizontal, in this case being the floor 44, so that the pelvic section is slightly declined from the hinge 6 onwards.

Moreover, the hinge 41 allows the chair as a whole to be reclined at a larger angle, e.g. 45°, with respect to the supporting frame 43, so that a sleeping or resting position is obtained.

The pelvic section 5 of the seat 2 is preferably mounted so that it can be detached from the connecting piece 40, so that the chair 1 without its supporting frame 43 can easily be transported in a car on the front or back seat in a ready-to-use condition. As the pelvic section 5 is practically flat at the bottom, there is no risk of possible damage to the car seat. The supporting frame 43 is collapsible with the aid of a hinge 45 and can therefore easily be separately transported.

According to the invention the upper leg section 4 can be adjusted by means of the hinge 6 independently of the position of the pelvic section 5, so that practically any angle required for suppressing stretching or flexion spasms can be attained without affecting the position of the pelvis, i.e. the proper sitting position. In the present context, the term hip angle refers to the angle confined by the upper legs sections 4 and the foremost section 7 of the pelvic section 5.

In order to prevent the weight of the lower legs and feet to put a load on the pelvis, a height-adjustable footrest 12 is provided, connected to a guide 13 which is

connected by means of a hinge 14, a connecting piece 15 and a hinge 16 to the seat 2. The hinges 14 and 16 and the height of the footrest 12 allow for adjustment to the length of the upper and/or lower legs.

The back 3 is hingably connected by means of a hinge 17 to the rearmost section 8 of the pelvic section 5. The rearmost section 8 of the pelvic section 5 extends up to a position at level with the lumbar region, preferably at the top edge of the sacrum of the lumbar spinal column. The angle confined by the rearmost portion 8 of the pelvic section 5 and a lowermost portion 20 of the back will be indicated by the term lumbar angle. In this way, independently of the position of the pelvic section 5 of the seat 2, the lumbar angle can be adjusted by means of hinge 17. In order to prevent the entire back 3 from being steeply reclined when the lumbar angle is great, a further hinge 18 is provide by means of which the uppermost section 19 of the back 3 can be adjusted with respect to the lowermost section 20. The hinge 18 is preferably located at level with the kyphotic maximum of the spinal column, in order to obtain an optimum adaptation to the spinal column for a given position of the lowermost section 20 of back 3 as determined by the lumbar angle. Apart from the fact that it allows an active posture, the adjustable uppermost section 19 of the back 3 also allows a suitable support for the head by means of a head support 24. Parts 13, 15, 4, 7, 8, 19 and 20, together constituting the framework of the chair, are preferably made of metal.

The actual support of the upper legs, the pelvis and back of the disabled is provided by the support faces 21 and 22 and a support face 23, respectively. If required for keeping a spastic in the desired position, shoulder supports 25, flank supports 26 and hip supports 27 may be provided. For an abduction of the legs, supports 28 are provided. The supports or padded means 24, 25, 26, 27 and 28 are each preferably a metal tube coated with a padding. The supports 24, 25, 26, 27 and 28 are connected by means of hinges 29, 30, 31, 32 and 33, respectively, to the framework of the chair 1.

The hinges 29, 30, 31, 32 and 33 are preferably devised so that the respective supports can be swivelled away from a fixed, adjustable position and back to that same position. The support faces 21, 22 and 23 and the coating of the supports or padded means 24, 25, 26, 27 and 28 may be made of a resilient plastic foam, e.g. soft polyurethane. The support faces 21, 22 and 23 may have been reinforced.

As indicated in FIG. 1, the support faces 21, 22 and 23 at least extend to over the pertaining hinges 16, 6, 17 and 18, and they are spaced from the framework of the chair by means of spacers 34, thus preventing sharp bends when supporting the body. The support faces 21, 22 and 23 are furthermore preferably mounted on either side of the pertaining hinges, by means of the spacers 34, so that the support faces are able to accurately follow the adjustment of the hinges 16, 6, 17 and 18. FIG. 1 shows this mounting for hinges 6 and 17. The slim framework formed by parts 13, 15, 4, 7, 8, 19 and 20 renders the chair relatively light-weighted and modest in size, making it practical to use.

FIG. 2 is a front view of the chair for the disabled according to FIG. 1, in which corresponding parts have been indicated by the same reference numerals.

FIG. 3 represents a second embodiment of the chair for the disabled. In as far as they are represented, the parts that correspond to those of the embodiments according to FIGS. 1 and 2 have been indicated by the same reference numerals. In this embodiment the upper leg section 4 consists of two halves 9 and 10, each being hingeable separately with respect to the pelvic section 5 in order to separately set a right and a left hip angle. The upstanding edges 11 formed at the halves 9 and 10 allow the legs to be abducted.

FIGS. 4 to 6 each schematically show another variant of the chair for the disabled according to FIG. 1. FIG. 4*a*, for comparison's sake, shows the chair according to FIG. 1 in the same schematic outline. In FIGS. 4, 4*a* and 5, A is used to indicate the distance between the hinging point 6 and the front of the substantially vertical rearmost section 8 of the pelvic section 5. If there is a support face 22, vide FIG. 1, the distance A is measured up to the front side of the support face 22. Thus the distance A will always correspond to the distance up to the patient's back. In FIG. 6, distance A is defined from the hinge 46 to the rearmost section 8. In the field of application of the chair for the disabled according to the invention, the extent of distance A is an important parameter. The distance A is preferably adjustable and equal to a value within the range of 4 to 15 cm, preferably 4 to 12 cm. For adjusting the distance A adjustment means may have been provided in the form of height-adjustable spacers 34 (vide FIG. 1).

In FIG. 4, a hinge 46 allowing the pelvic or rear section 5 to be adjusted and fixed is in line with the hinge 41 for adjustably connecting the support 43 to the seat 2. Contrary to the embodiment according to FIG. 4*a*, the hinge 6 does not connect the pelvic section 5 to the upper legs section 4 any longer. This disconnection allows for distance A to be set by a displacement of the hinge 6 with respect to the pelvic section 5. As in FIGS. 1 and 4*a*, the hinge 6 is located above the hinge 41.

In FIG. 5 all three hinges 6, 41 and 46 are aligned.

In FIG. 6, the hinge 6 that allows the upper legs or front section 4 of the seat to be adjusted and fixed is in line with the hinge 41 for adjustably connecting and support to the seat. Hinge 41 is then located at the front end of the front section 41 destined to support the upper legs. The hinges 6 and 41 are in line with the hinge 16.

It is remarked that many alterations to the above-described embodiments of the chair for the disabled according to the invention can be made by any expert without deviating from the scope of the invention. It will e.g. be clear that the support faces 24, 25, 26, 27 and 28, or at least a number thereof, can be omitted for the less severely disabled, whose spasms do not require the presence of these supports. In that case the chair for the disabled according to the invention is even more modest in size and appearance with respect to the disabled person.

I claim:

1. Chair for the disabled, comprising at least a seat, a back and a supporting frame, the seat being adjustably connected to the back by means of a hinge at the rear end of the seat, and the supporting frame being adjustably connected to the seat by means of a hinge, the axes of the said hinges being parallel to one another, wherein the seat is divided into a front section destined to lie beneath and support the upper legs and a rear section destined to lie beneath and support the pelvis, and wherein the front and the rear section can each be fixed and adjusted independently of one another by means of a hinge that is parallel to the hinge at the rear end of the seat.

2. Chair for the disabled according to claim 1, wherein the hinge which allows the rear section to be

adjusted and fixed is in line with the hinge for adjustably connecting the supporting frame to the seat.

3. Chair for the disabled according to claim 1, wherein the hinge which allows the front section to be adjusted and fixed is in line with the hinge for adjustably connecting the supporting frame to the seat.

4. Chair for the disabled according to claim 1, wherein the hinge which allows the front section to be adjusted and fixed is located above the hinge for adjustably connecting the supporting frame to the seat.

5. Chair for the disabled according to claim 1, wherein the distance (A) from the hinge between the front and the rear section to the front of the back ranges from 4 to 15 cm.

6. Chair for the disabled according to claim 5, wherein adjustment means are provided for adjusting the distance (A).

7. Chair for the disabled according to claim 1, wherein the section of the seat destined for supporting the pelvis comprises a rearmost section extending up to a position at level with the lumbar region, preferably at the top edge of the sacrum of the lumbar spinal column, at which position the hinge is located for adjustably and fixedly connecting the back to the seat.

8. Chair for the disabled according to claim 7, wherein the back is also hingable at the point of the kyphotic maximum of the spinal column.

9. Chair for the disabled according to claim 1, wherein the section of the seat which is destined to support the upper legs comprises two halves, each being separately and adjustably connected to the section of the seat destined to support the pelvis region.

10. Chair for the disabled according to claim 1, wherein the section of the seat destined for supporting the upper legs is hingably connected to a footrest by means of at least one hinge.

11. Chair for the disabled, comprising at least a seat, a back and a supporting frame, the seat being adjustably connected to the back by means of a hinge at the rear end of the seat, and the supporting frame being adjustably connected to the seat by means of a hinge, the axes of the said hinges being parallel to one another, wherein the seat is divided into a front section destined to lie beneath and support the upper legs and a rear section destined to lie beneath and support the pelvis, and wherein the front and the rear section can each be fixed and adjusted independently of one another by means of a hinge that is parallel to the hinge at the rear end of the seat, said rear section of the seat having a foremost section which is positioned at a downward slope towards the rear with respect to the horizontal, at a small angle of about 5°.

12. Chair for the disabled, comprising at least a seat, a back and a supporting frame, the seat being adjustably connected to the back by means of a hinge at the rear end of the seat, and the supporting frame being adjustably connected to the seat by means of a hinge, the axes of the said hinges being parallel to one another, wherein the seat is divided into a front section destined to lie beneath and support the upper legs and a rear section destined to lie beneath and support the pelvis, and wherein the front and the rear section can each be fixed and adjusted independently of one another by means of a hinge that is parallel to the hinge at the rear end of the seat, and support members in the shape of a number of support faces extending at least over a hinge.

13. Chair for the disabled according to claim 12, wherein a number of the support faces is connected on either side of a hinge by means of spacers.

* * * * *

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United States Patent [19]

Carlson et al.

[11] Patent Number: 5,695,245

[45] Date of Patent: Dec. 9, 1997

[54] **ORTHOTIC SEAT**

[75] Inventors: **J. Martin Carlson**, Edina; **Joseph S. Bieganek**, St. Cloud; **Mark J. Payette**, Hugo, all of Minn.

[73] Assignee: **Tamarack Habilitation Technologies, Inc.**, St. Paul, Minn.

[21] Appl. No.: **547,575**

[22] Filed: **Oct. 24, 1995**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 328,430, Oct. 25, 1994, abandoned.

[51] **Int. Cl.**[6] **A61G 5/00**

[52] **U.S. Cl.** **297/314**; 297/284.7; 297/353; 297/464

[58] **Field of Search** 297/256.13, 284.7, 297/314, 353, 410, 464, 452.55

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Primary Examiner—Peter R. Brown

Attorney, Agent, or Firm—Westerman, Champlin & Kelly, P.A.

[57] **ABSTRACT**

A modular orthotic seat is made up of individual shells or modules that are adjustably connected together for accommodating changes in size of the user. The modules include a pelvic module for support of the thighs, pelvis and sacrum, a thoracic module for support in the thorax and lumbar regions, and a cervical-head support. The modules are mounted on a strut that permits adjustment between the modules. Suitable bedding or padding can be used for final custom fitting. An adjustable seat pan is provided for permitting adjustment of the supporting seat to accommodate angular variations of the pelvic regions of the user.

17 Claims, 7 Drawing Sheets

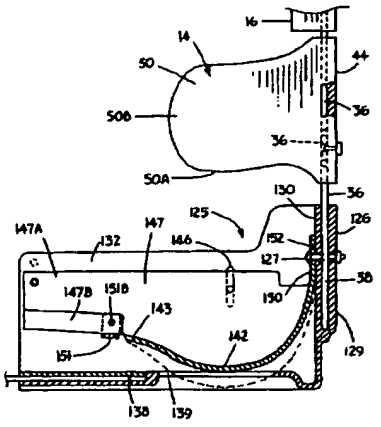

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FIG. 1

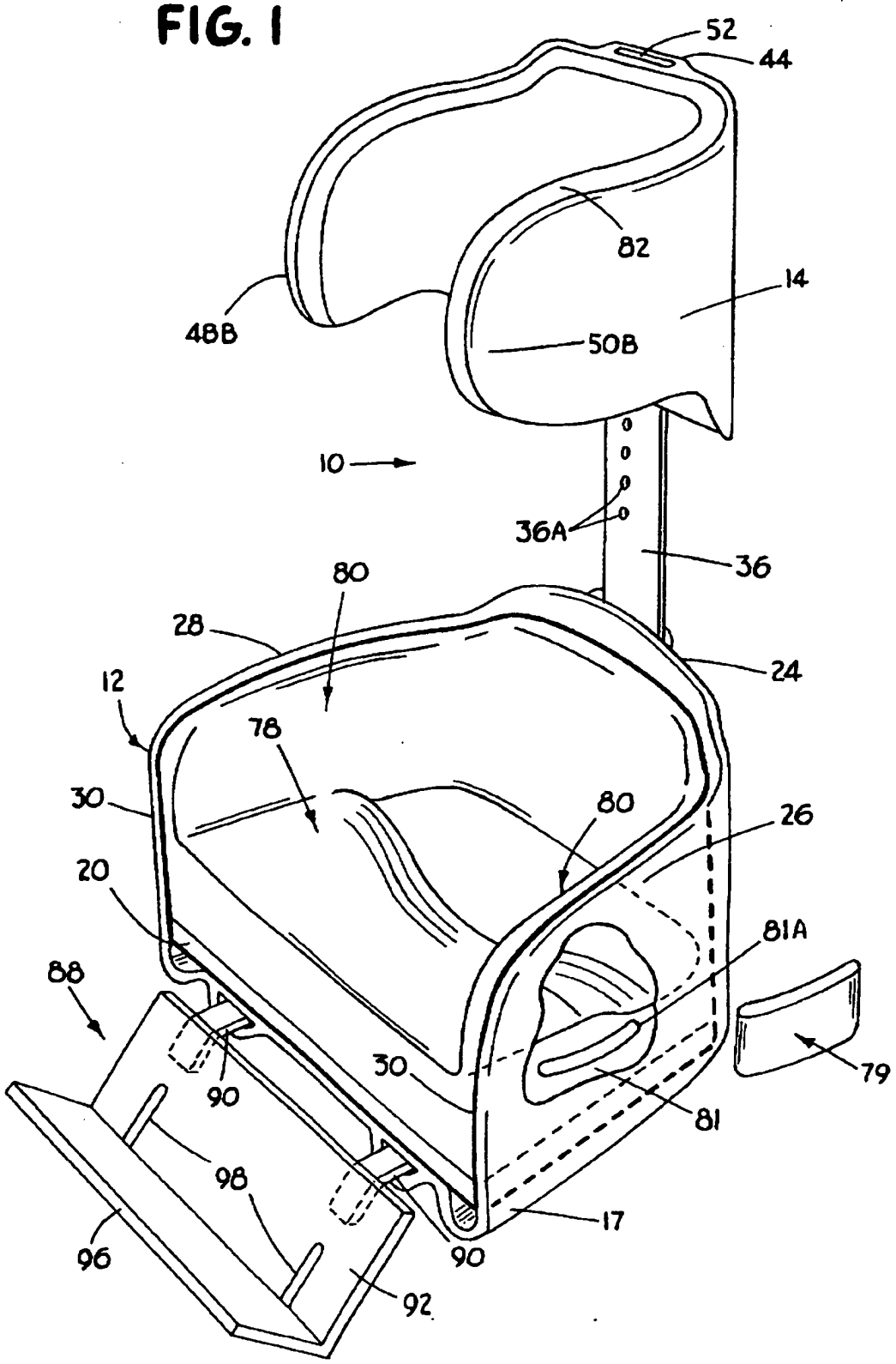
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FIG. 2

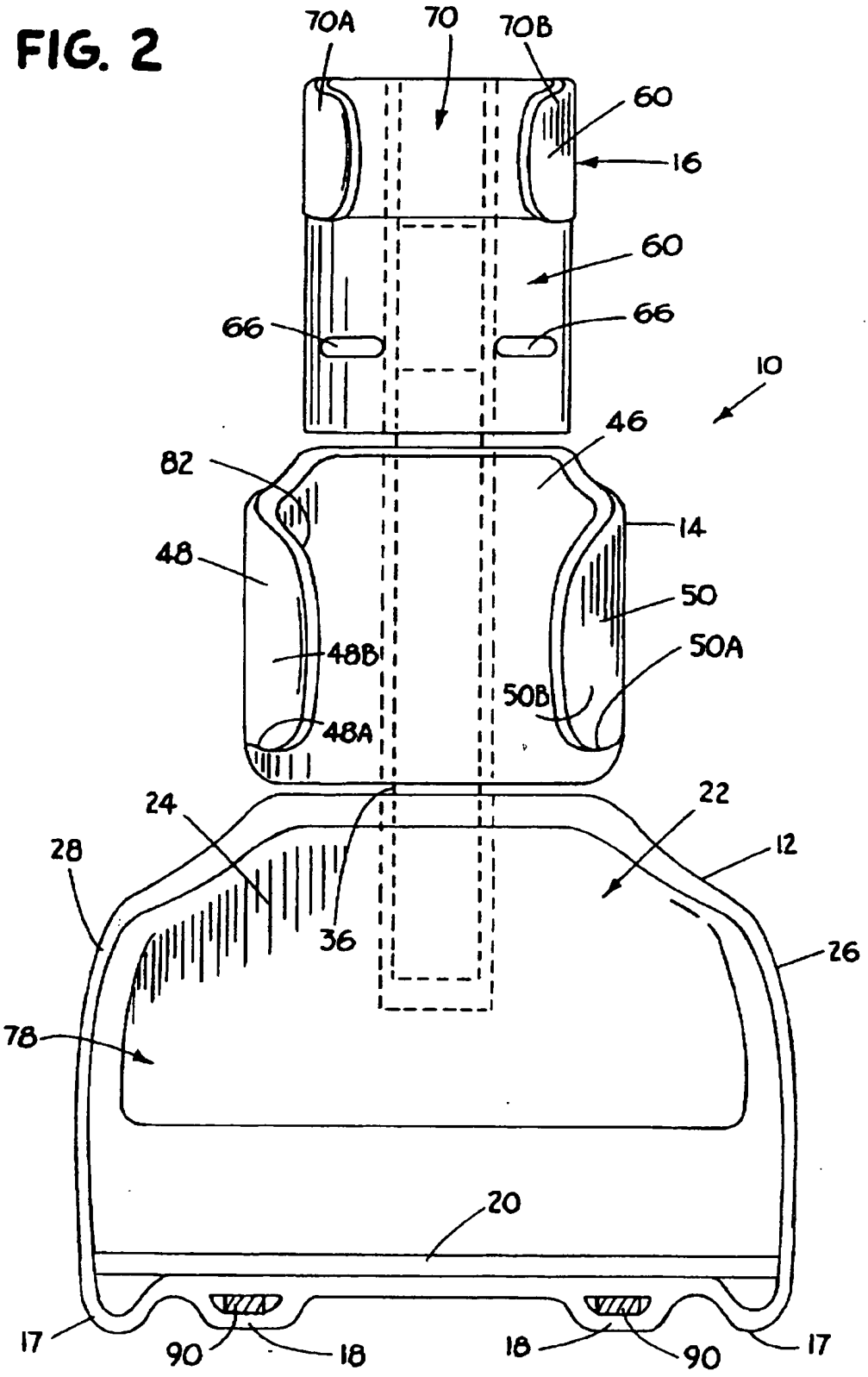
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FIG. 3

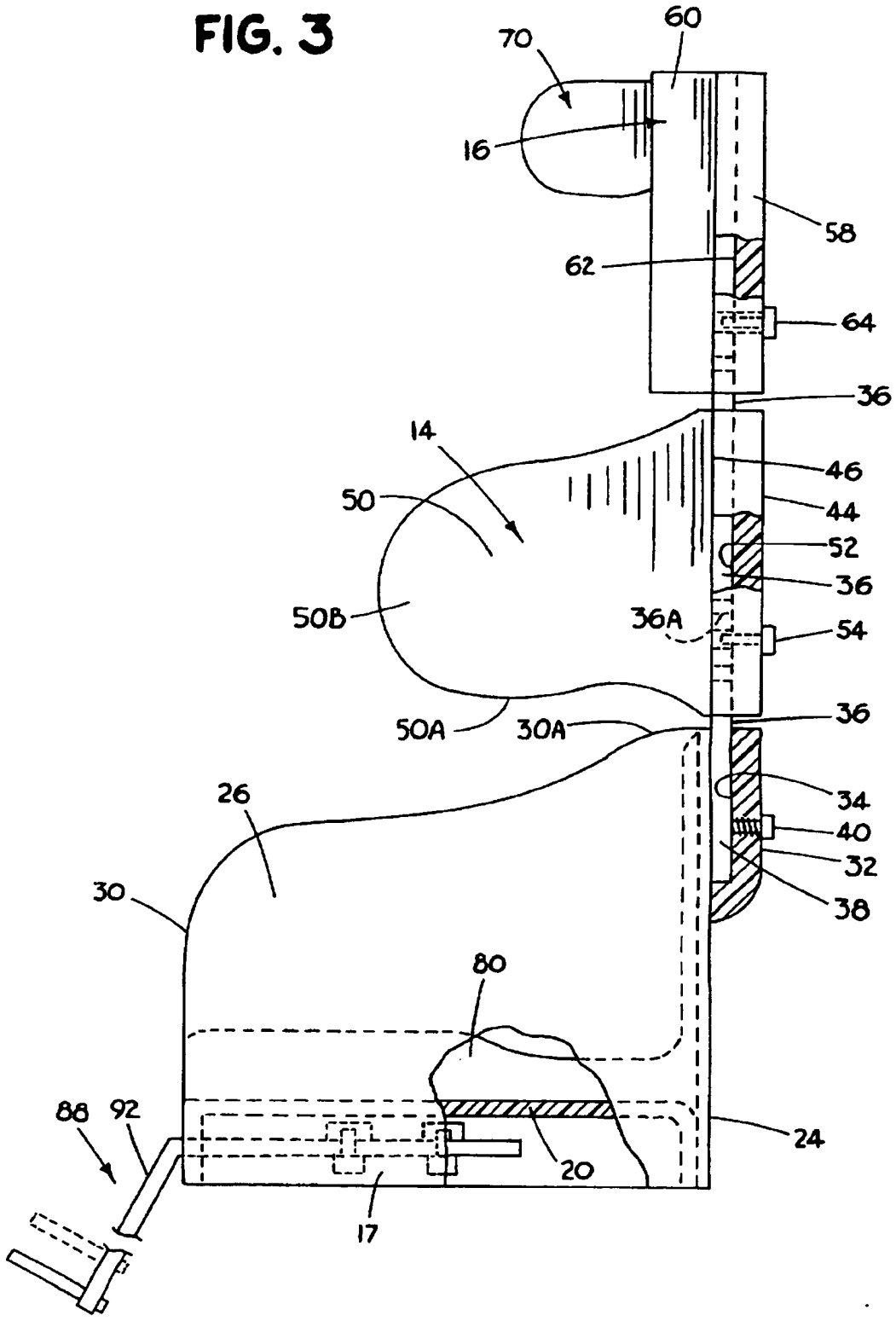
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FIG. 4

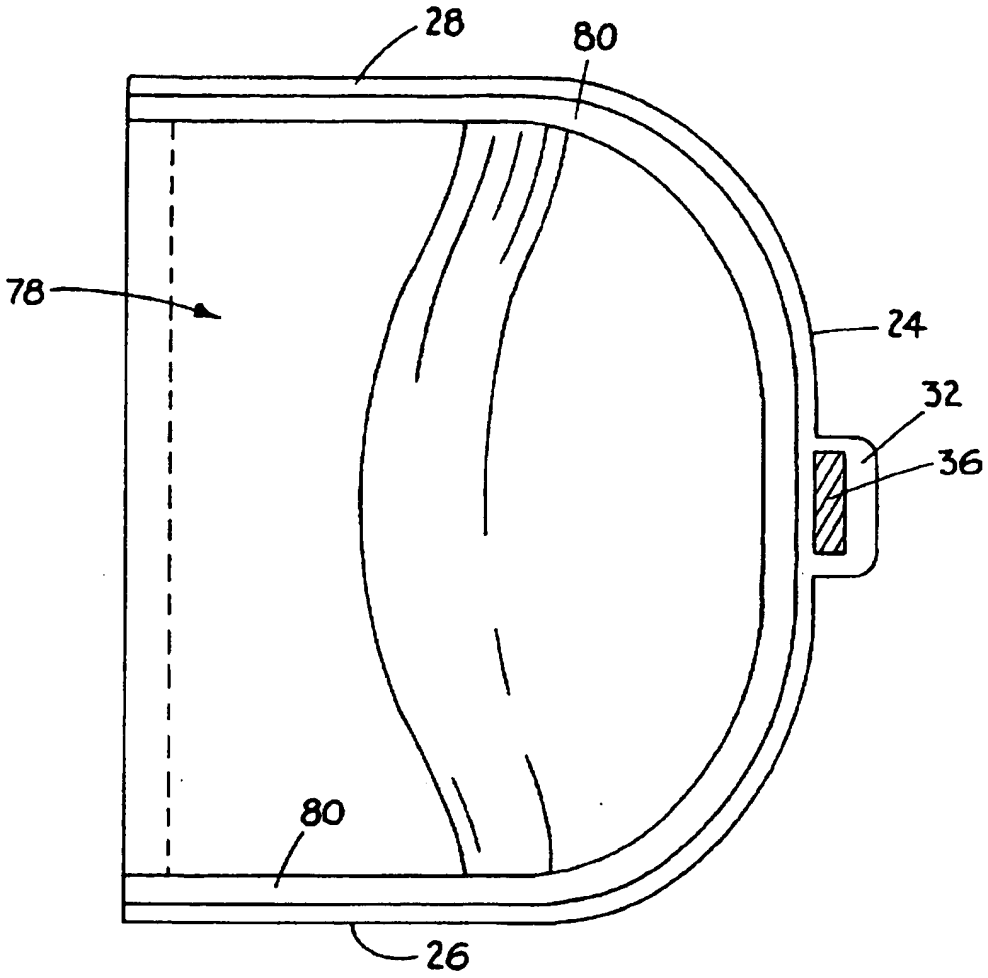

FIG. 5

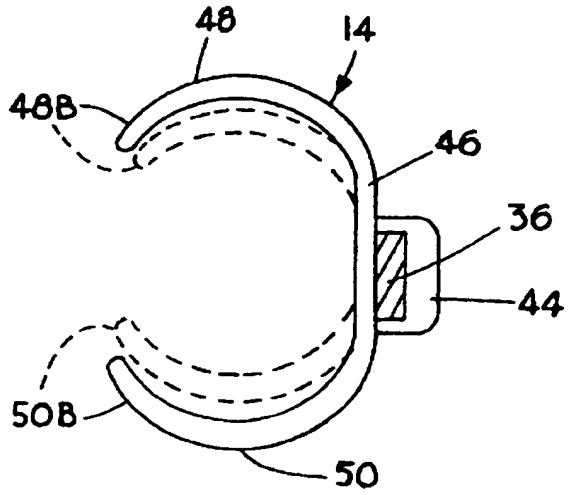

FIG. 6

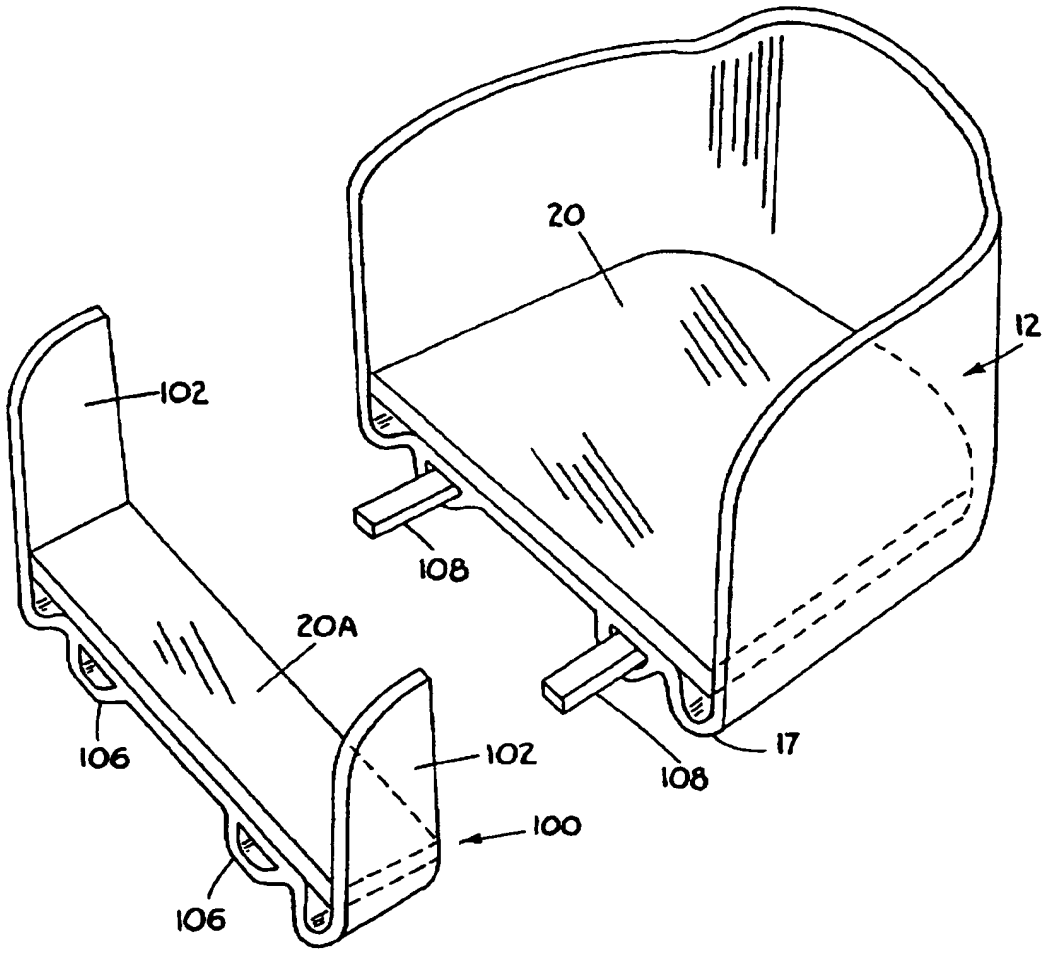

FIG. 7

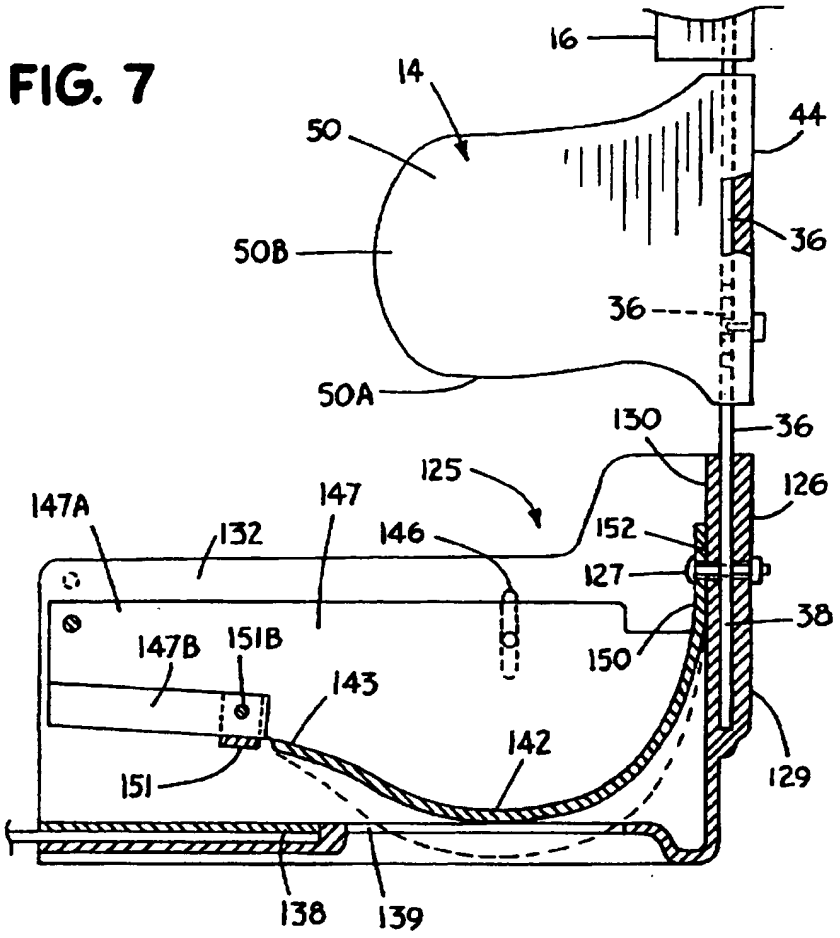
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FIG. 8

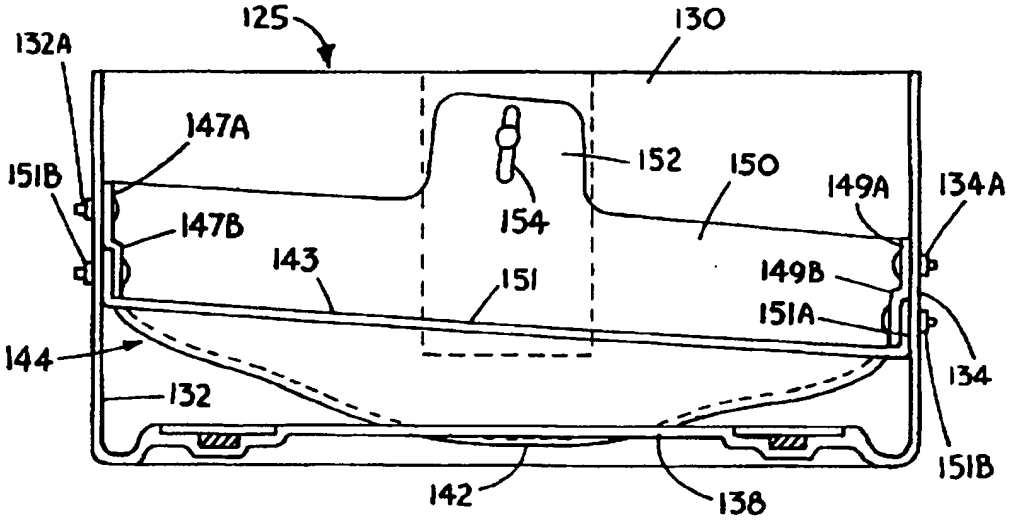
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FIG. 9

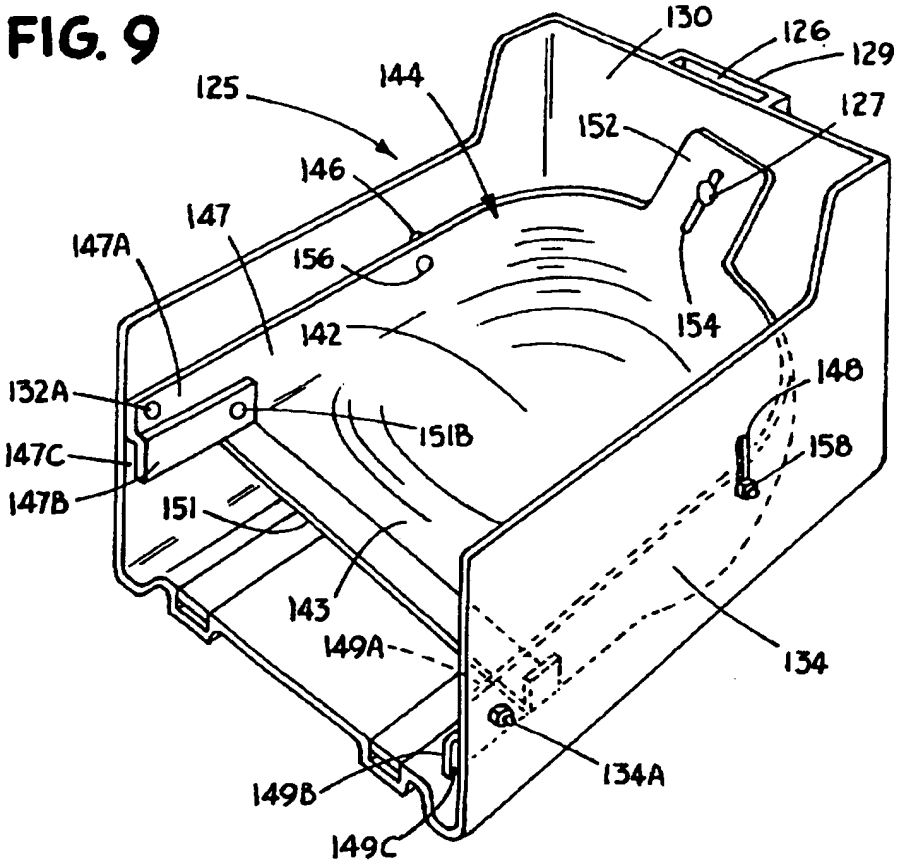
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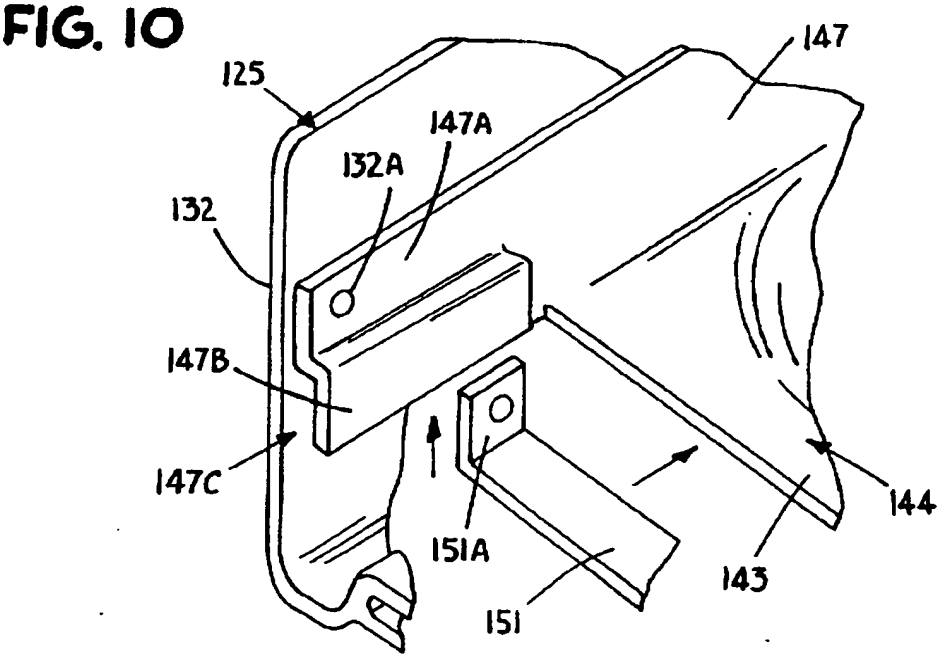
FIG. 10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ORTHOTIC SEAT

CROSS REFERENCE TO RELATED APPLICATION

This is a Continuation-In-Part of application Ser. No. 08/328,430, filed Oct. 25, 1994 for ORTHOTIC SEAT now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates to a shell that can be used as a postural orthopedic seating system capable of adjustment to provide necessary head, cervical, thoracic, lumbar, pelvic, hip and thigh supports, particularly for growing children, and which can be adjusted to accommodate growth, as well as being shaped to provide support and comfort for a person utilizing the seat. In a variety of sizes, this invention is also useful to address the orthopedic and decubitus prevention needs of people with impairments acquired during adulthood.

At the present time, anatomically supporting orthopedic seats for severely impaired children are custom fabricated and fitted to provide necessary support and restraint. Usually a custom formed shell is utilized that extends from a pelvic portion, up through a thoracic support portion and may include support for the head and cervical spine of the user. However, as growth occurs, a new shell has to be made with regularity, thereby increasing the cost and also the availability of the highest quality anatomically supportive orthopedic seats for persons that could benefit from such supports. Custom built shells are comfortable, and can be made to fit well, but they are time consuming to make and enlarging the shell dimensions differentially in different areas to accommodate growth requires considerable time and very specific skills.

Other types of anatomical chairs have been sold. For example, a chair sold under the trademark SNUGSEAT by Snugseat Incorporated has a unitary shell that requires substantial amounts of padding in order to provide for appropriate fit, and it too, has limitations in its supporting capabilities, as well as limited capacity to accommodate growth. The Snugseat design is typical of many commercially available designs which utilize a grossly oversize shell frame. Fitting of the seat involves either a "building block" or a sculpting operation to the foam insert components. Close anatomical support to the user's thorax does not leave the arms free.

Mulholland Positioning Systems, Inc. of Santa Paula, Calif., sells a chair that folds and provides a frame that permits adjustment of some support pads on the large frame. The Mulholland design is adjustable through a multiplicity of brackets, columns, and beams extending some distance from the child. That design offers adjustability but the child appears to be occupying a "seating machine". It also does not provide the firm, form-fitted support required for some orthopedic goals.

The need exists for a modularized shell system that can be adjusted for accommodating growth, as well as being adjustable for proper fit, using substantially standard modules for construction. A system which can provide close anatomic support as necessary for orthopedic control, which leaves arm motion free, and which does not draw attention away from the child is desired.

SUMMARY OF THE INVENTION

The present invention relates to a modular shell system used for constructing orthotic seats for a wide range of sizes and skeletal configurations, wherein different size modules can be intermixed and independently adjusted as desired. The modular shell system of the present invention includes adjustable sections that can be moved relative to each other as user growth occurs. The shells have adequate space for some padding variations which may be dictated by the patient's needs.

In particular, the present invention provides at least two modules, including a pelvic-seat shell module that is molded to provide a support surface for the pelvic/thigh bedding, and having side walls and a back wall for providing lateral and rear support. A suitable adjustable foot plate can be attached to the seat module for supporting the feet of a user as well.

The pelvic shell module supports an upright strut or struts secured to the rear of the pelvic shell module and slides into a provide groove in a thoraco-lumbar module that has a back wall and side walls that fit along the lateral sides of the thorax of a user. The adjustment in vertical direction along the support strut permits placement of the thoracic module in the proper location for providing the needed support, and also provides for adjustment as the user grows. That portion of the strut which is spanning the separation between the two modules can be bent to easily alter the relative alignment between pelvis and thorax as required by the patient. When needed a head-cervical support can be adjustably mounted on the upright strut as well, and it can have slots for shoulder straps and for mounting padding for supporting the head laterally.

The thoracic shell module in particular is formed from a moldable thermo-plastic material, so that the side or lateral supports can be heated and formed to closely fit a user, as desired.

The head-cervical shell module adjustment along the upright strut is relative to both the thoracic shell module and the pelvic shell module, to accommodate needed initial positioning and to accommodate changes for growth. The upright strut is capable of being bent into configurations to fit unusual skeletal conditions, including bending the upright strut rearwardly (or forwardly) to move the thoracic shell module to the rear (or forward) relative to the pelvic module. The strut can be twisted as well to accommodate desired orientations of the modules. In use, however, the strut is quite sturdy and provides adequate support without undue flexibility.

For patients with a "pelvic tilt", that is, misalignment of the pelvis relative to the spine, an adjustable seat pan is provided. The adjustable seat pan can be adjusted about fore and aft and lateral axes to compensate for pelvic tilt in directions from a generally horizontal plane. Some height adjustment relative to the support shell frame is also provided.

The shell modules are made in several standard sizes, and the sizes of different modules can be intermixed, so that, for example, a large pelvic module can be used with a smaller thoracic shell module.

This particular design provides structural integrity and adjustability by means of a unique combination of modules mounted adjustably on a system of close fitting struts. Further, the pelvic tilt adjustment accommodates requirements of tilted seat support. The result is an orthopedic seating system which, in addition to the other features, fits so close to the user's body profiles that it is much less bulky, less noticeable as an aid, and therefore cosmetically superior. The two-axis adjustability of the seat pan relative to the rest of the seat, particularly with respect to the base module,

allows for specific pelvic alignments necessary to accommodate orthopedic deformities of the spine/pelvis/hip area and/or to accommodate alignments judged to be advantageous for other therapeutic reasons.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a seat made according to the present invention using a pelvic module and thoracic module;

FIG. 2 is a front elevational view of an orthotic seat of the present invention having a pelvic module, a thoracic module and a cervical support module assembled together;

FIG. 3 is a side elevational view of the device in FIG. 1;

FIG. 4 is a top plan view of a pelvic module made according to the present invention;

FIG. 5 is a top plan view of a thoracic support made according to the present invention;

FIG. 6 is a perspective exploded view of a pelvic module with a length extension member illustrated;

FIG. 7 is a side elevational view of a modified form of the invention having an adjustable seat pan in the pelvic module to accommodate pelvic tilt;

FIG. 8 is a front view of the pelvic seat pan and pelvic module of FIG. 7;

FIG. 9 is a perspective view of the device of FIG. 8; and

FIG. 10 is a perspective view of a thigh support strip that can be added to the front of the seat pan of FIG. 7.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. 2, the assembly of the orthotic seat indicated generally at 10 is illustrated. The seat is modular, including a pelvic or seat-bottom shell module 12, a thoraco-lumbar shell module 14, and a cervical-head support module 16. The pelvic or seat-bottom shell module 12 includes a lower support base 17 that can be formed into a solid wall, or skirt type which can be braced with suitable cross braces. The base 17 has a support edge, which can be rested on a surface. A pair of guide sleeves 18 are molded in place with supporting straps for a foot rest or size change module. Normally, this type of an orthotic seat will be used in a chair, a wheelchair, or some other exterior support.

The pelvic shell module 12 further includes a seat platform wall 20, that is made of a suitable size, and an upright wall assembly 22 extending up from the seat platform wall 20, including a rear wall portion 24. Side wall portions 26 and 28 are also provided. The pelvic shell module 12 is molded as a single unit, and it can be seen that the side wall portions 26 and 28 have gently curved front edges 30 that insure that there are no sharp corners or bumps that may be unsafe. The rear wall 24, on its exterior, as shown, has a molded in channel 32 that has an interior passageway or socket shown at 34 in FIG. 3. The passageway 34 is of size to receive an upright or vertical strut 36 that is of suitable size to provide adequate rigidity and yet may be bent if necessary. Normally the upright strut 36 would be a bar of aluminum or some other material that did not rust or corrode. Two or more channels 32 and struts 36 can be used for larger designs. The strut has an end portion indicated at 38 retained in the passageway 34. A suitable fastener or fasteners shown schematically at 40 in FIG. 3 are used for locking the upright strut 36 in position within the opening 34 of the socket 32.

The strut 36 extends upwardly above an upper edge 30A of the rear wall 24 of the pelvic or seat module. The strut 36 is passed through a suitable formed sleeve or channel 44 on a rear wall 46 of the thoracic-lumbar shell module 14. The thoraco-lumbar shell module 14 also has integrally molded lateral side support walls 48 and 50, respectively that, as shown, are curved and trimmed for a suitable fit and clearance, including upwardly curved lower edges 48A and 50A extending toward the rear wall 46 from outer ends 48B and 50B. The outer ends 48B and 50B gently curve inwardly toward each other, that is toward a center plane. The outer ends 48B and 50B of the side walls also are rounded off with large radius curves.

The thoracic shell module 14 is slidable along the upright strut 36. The channel 44 has an interior opening 52 slidably receiving the strut 36. The thoracic shell 14 can be secured at a desired location along the strut 36 through the use of suitable cap screws, such as that shown schematically at 54. The cap screws thread into the outer wall of the channel 44 and bear against the strut 36. If adjustment at desired intervals along the length of the strut 36 all that is needed is a series of holes 36A which may be formed in the strut 36 to receive a pin or threaded bolt passing through the walls of the channel 44.

As shown, the strut 36 extends through the channel 44, and also mounts into a sleeve or channel 58 that is part of the cervical-head support or restraint module 16. As shown, the cervical-head support module 16 is a generally flat member 60 on which the sleeve 58 is formed. The end portion of the strut 36 extends into an opening or slot 62 formed in the sleeve 58. The position of the cervical-head support module 16 can be maintained using a suitable set screw 64, or by pinning the unit in place at desired positions through use of suitable holes in the strut 36 and the cervical-head support.

The cervical-head support module 16 can have openings or slots shown at 66 formed therethrough for receiving and retaining straps for retaining the head of a user of the orthotic seat 10 in a desired position. Padding can be added, as desired, including suitable lateral supports for holding the head from side to side movement. The type of supports used are well known, vary with the disability of the child, and are not specifically shown as to various forms. As shown, a suitable head pad 70 can be supported on the board member 60 with fasteners, such as hook and loop fasteners sold under the trademark VELCRO, or by snaps or other securing devices.

The U-shaped head support 70 is a foam pad covered with a fabric so that a head positioned between the side portions 70A and 70B will be held in position.

FIG. 1 is an enlarged perspective view of the seat or pelvic shell module 12 and the thoracic shell module 14, and illustrates that the strut 36 and holes 36A for providing adjustment for the thoracic shell module 14. Also, the bedding or padding indicated at 78 is illustrated in position supported on the seat wall 20 of the pelvic shell module 12. The bedding can be foam cushions formed to fit the user's skeletal contours. The bedding also can comprise adjustable padding where small inserts of foam or other pad materials are placed under an outer covering (fabric) for adjusting the fit and conformability of the bedding to the user, as will be described.

The lateral side walls 26 and 28 provide lateral support for a person sitting in the pelvic shell module, and the lateral sides also can have bedding indicated at 80 mounted on the side walls or as part of lateral (and posterior) extensions of the under bedding in a suitable manner, again such as with hook and loop or snap fasteners, or the like.

The adjustment pad shown at 79 in FIG. 1 is typical of pads that can be used to provide close fitting support and to

accommodate size difference between the patient and the various standard module size configurations. As the child grows, the pads **79** may be removed or thinned to inexpensively accommodate growth or weight gain. The pad **79** can be inserted into an outer covering **81** of the bedding through a slit or pocket opening **81A**. Such auxiliary padding of various shapes, and covered or uncovered can be used in pockets or merely placed between the bedding and the shell. The auxiliary pads can be used with the thoracic and cervical pads as well.

The thoracic shell module **14** is shown in FIG. **2** with padding **82** in position. It can be held in place in a suitable manner. The padding **82** along the sides of the thorax can be reduced in thickness, and even eliminated for more direct support against the thorax of a user. The outer end portions **48B** and **50B** can be molded or formed by using a suitable thermo-plastic material for forming the thoracic shell module **14**, and then custom fitting the sides by heating and forming to fit a user.

FIGS. **4** and **5** are top plan views of the pelvic shell modules and thoracic shell modules, respectively. It also can be seen there that the side wall portions **48** and **50** of the thoracic shell module **14** can be bent to positions to change the lateral size of the thoracic shell upon suitable heating of the material as shown illustratively in dotted lines. The outer end portions **48B** and **50B** also can be curved in at different amounts from each other for custom fitting on each side if non-symmetrical support is desired.

One of the advantages of the present invention is that different size pelvic shell modules can be made, for a range of individual sizes, and then the bedding or padding **78** can be custom fit for individuals within a particular size range. Thus, instead of having to custom fit each shell, as was needed because of the previous molding of unitary seat assemblies, having standard size pelvic shell modules in several different sizes will provide a wide range of support for individuals requiring the orthotic seat support, since the pelvic shell module is a "receiver" for the bedding unit. There are open options for the bedding to address a variety of needs and professional interpretations of what is best for the child. The bedding needs only to fit the shape and size of the "receiver" module. Likewise, the thoracic shell modules can be made in several different sizes. Then either padding applied, for custom fit, or the side walls of the thoracic shell module can be molded to fit an individual. The vertical height of the thoracic shell module relative to the pelvic shell module is easily adjusted utilizing support strut **36**, or other types of adjustable vertical supports. Also, the alignment of the thoracic support module may be adjusted, as described earlier, by bending and/or twisting the strut **36**. The advantage of a single strut is that such alignment adjustments are greatly simplified.

The same is true with the cervical-head support module, in that the cervical-head support module can have custom pads attached to it and it can be vertically adjusted to fit the user.

The seat assembly **10** can be used as shown in FIG. **1**, without a cervical-head support, if desired. As can be seen, there is a substantial amount of vertical adjustment between the upper edges of the pelvic shell module and the thoracic shell module.

By having modules that can be mounted onto a common support, such as the strut **36**, if the physical size of a user of the orthotic seat is proportioned differently than what a standard seat would be, a small thoracic shell module can be used with a large or medium sized pelvic shell module, and the vertical height adjustment can easily be made as explained. While the term "thoracic" shell module has been used for the module **14**, it in fact can also be a lumbar support, and can be termed a thoraco-lumbar module as well. The cervical-head support module also may be termed an occipito-cervical module.

The pelvic module supports the thighs, pelvis and sacrum of the user. The heating and forming of the thoracic module can be used for accommodating spine alignments, where the thorax is displaced laterally from the pelvic center line, and as was stated, the strut **36** can be bent in fore and aft direction and even can be bent laterally if necessary for fitting.

The pelvic shell module provides many fit and support options. Preshaped or custom shaped foam pads can be provided in the bedding for a full variety of options including the firmness of the foam, such as firm foams, soft visco-elastic foams, or gels, depending on the support and cushioning needs of the user. The modular shell also provides for a more open design than previous unitary shells because of the spacing between the modules that provide for better air circulation and a more unobstructed view of the patient. The bedding can be covered with any type of cover that is desired. The bedding pads for individual modules are easier to cover than pads for an entire molded shell that includes a full length support for the back and head. The insert pads **79** can also be made of any desired materials.

The side wall members of the thoracic shell module can be independently mounted onto the back wall, so that they can be adjusted independently as desired. As shown in FIGS. **2** and **3**, partially cut away, a foot support indicated at **88** can be molded to be L-shaped, and can have a pair of horizontal support straps **90** supporting a depending wall **92**. The support straps are adjustable in and out in guides in the pelvic shell and by providing slots in the straps **90**. Cap screws extend through the slots in straps **90** and thread into bosses formed on the bottom of seat **20**. The slotted straps **90** provide in and out adjustment of the foot support. Up and down adjustment also can be provided by adjusting a step **96** along slots **98** on wall **92** with cap screws extending through the slots and threaded into the back of the step.

The foot support **88** can be at a desired angle relative to the seat **30**. Padding can be provided on wall **92** as well. The bedding that is used on the seat **20** can be provided with openings for the straps **90**.

Another feature of the invention is that the seat **20** can be trimmed as needed for fitting a particular patient or user initially, so that the distance between the back wall and the front edge of the seat can be changed. Further, it can easily be understood that a continuous strut **36** is not necessary, and more than one strut can be used. Two struts could be used for supporting the thoracic module relative to the pelvic module, and a single strut used between the thoracic module and the cervical-head support module, for example. The fitting method comprises providing a multiplicity of standard sizes of the pelvic support module and the thoracic support module, and selecting one size of each module adapted for the intended user. The modules are supported relative to each other. Custom bedding is than used in the pelvic support module for supporting and fitting the user, and padding is also added in the thoracic support module. The vertical adjustment between the modules is made for fitting also. The side walls of the thoracic support module can be formed as part of the fitting process. Also, the auxiliary pads can be inserted as needed in both modules. The cervical-head support module can be added and

adjusted for final fitting. If desired, the strut 36 can be bent at an angle as shown in FIG. 3 to fit various modules to the patient.

As shown in FIG. 6, the pelvic shell module 12, which is made according to the present invention and is shown without any bedding in place, desirably has adjustments for the length of the seat 20 and the bedding itself, for accommodating variations, and growth of thigh length. The anterior-posterior "depth" of the seat 20, is adjustable as shown in FIG. 6 by providing an extension piece 100, that can be made to replicate the forward end of the seat 20. The seat 20 supports the bedding. The extension piece 100 includes a pair of upright walls 102 that mate with the side walls of the shell module 12, and a floor extension 20A that will mate with the forward edge of the seat 20.

Suitable channels shown at 107 are made to receive bar support members 108, and can be clamped in place on the bar support members. The bar support members 108 are held as the supports 90 are held, and by securing the seat extension 100 to the bar, the seat extension 100 can be held tightly in place. The securement can be with suitable set screws or pins acting through the channels 106.

The side walls 102 can be curved as shown at desired forward edges, and can be made the same height as the side walls for the pelvic shell module 12.

Front portions of the seat can be cut off from a shell as the shell or bedding are trimmed back for proper length during fitting. The seat portion that is removed can form a seat extension if needed later for growth. Another way of providing seat extension 100 is to form the extension separately for a particular arrangement that is desired. Seat extensions can be made in several widths so a substantial range of adjustments are possible.

A second form of the pelvic shell module useable alone or with other modules of the present invention is illustrated in FIGS. 7, 8, 9 and 10. The cervical head support module 16 and the thoraco-lumbar shell module 14 are constructed as previously explained, and are therefore shown in FIG. 7 in place with the same numbers as in the previous form of the invention. However, the pelvic shell module or support frame 125 is modified to incorporate a pelvic tilt feature for custom fitting the seat to a user with or without the other modules. A channel 126 receives the end portion 38 of the strut 36 used for supporting the modules 14 and 16. The channel 126 is formed in a sleeve 129 that is molded onto a back wall 130 of the pelvic or seat bottom shell module 125. In all forms of the invention, one or more sleeve 129 and support strut 36 may be used. The pelvic or seat bottom shell module 125 includes side walls 132 and 134 which are integrally molded to join the rear wall 130.

The pelvic support module 125 has a bottom wall 138 with a cut out or opening 139 that is made of size to permit a recessed bottom wall portion 142 of a tilting seat insert pan 144 to protrude through the opening 139, and form a seat bottom for the user.

The seat insert pan 144 is made so that it can be adjusted for "pelvic tilt". The side wall 132 of the pelvic module has a first slot 146 therein, and the side wall 134 has a second slot 148 formed therein.

The seat insert pan 144 bottom wall portion 142, is joined to a front bottom wall portion 143 that is for supporting an occupant of the pelvic module 125. The pan 144 has molded side walls 147 and 149 that join the bottom wall 142, and which are molded to rear wall 150. The rear wall 150 has an adjustment tab 152 protruding up from the general level of the wall, and the adjustment tab 152 has a slot 154 therein.

The front ends of the side walls 147 and 149 have portions 147A and 149A that project farther forward than the front portion 143 of the bottom wall, and have integral offset flanges 147B and 149B that form retainer recesses 147C and 149C. The front wall portion 143 of the seat bottom can be extended with thigh support components 151. Holes can be drilled (or provided) through the flanges and the ends 151A for receiving fasteners 151B that hold the thigh support components 151 in position. The thigh support extension components 151 extend across the front of the seat bottom wall. The thigh support extension component 151 may take the form of bars, tubes, or other suitable cross section shapes suitably attached to the flanges 147B and 149B. When in place the holes can be drilled and the parts held with fasteners, the thigh support components (one or more can be used) will provide extra length for the seat and thus provide thigh support. Several thigh support components 151 can be added if desired to extend the seat out even with the ends of the side walls. The components 151 are made strong enough to provide support.

The seat pan side wall 147 has an aperture or opening that aligns with the slot 146 for a fastener 156, and the side wall 149 has an aperture or opening that aligns with the slot 148 for a fastener 158. The fasteners can be small bolts that are tightened in place.

Also, the forward portions 147A and 149A of the side walls 147 and 149 have holes drilled through them. When the proper angle and position is determined for the seat pan for a particular child, the holes are also drilled through the side walls 132 and 134 of the pelvic shell module. Fasteners 132A and 134A pass through these openings to secure the front ends of the seat pan 144 in place. The holes can be drilled in place as needed, so only one hole is shown.

The rear wall 130 of the pelvic shell module 125 has an aperture that aligns with the slot 154 to receive the fastener 127, which passes through the sleeve 129, the strut 36, the rear wall 130 and through slot 154, for tightening the seat pan and wall 130 together at the rear.

The apertures in the side walls 147 and 149 hold suitable threaded fasteners that have relatively smooth heads and can be used with wing nuts on the exterior of the pelvic shell module 125 for tightening the pelvic shell seat insert pan 144 in position. The pelvic seat insert pan can be adjusted with a substantial amount of tilt laterally and also with a reward or forward slope. As shown in FIG. 8, the seat pan 143 can be tilted as illustrated in the solid line position or tilted in the opposite direction. The side wall slots in the pelvic support module are sufficiently long to permit the desired lateral inclination of the seat pan 144. The seat pan 144 will pivot about the bolt or pan 127. The forward tilt or slope, shown in FIG. 7 in dotted lines is obtained by use of the slot 154 to raise or lower the rear of the seat pan 144. The seat pan will pivot on the bolts or pins 156 and 158. The tilt can be at a compound angle, that is the seat pan can have both a lateral tilt and fore and aft tilt. The downward tilt of the rear of the seat pan 144 is not very great but is adequate for most situations.

Further, the height of the seat pan 144 can be adjusted to a certain extent, as permitted by the slot adjustments, so that the seat pan bottom can protrude through the opening 139, or it can be lifted above the bottom wall 138.

The seat pan of course can tilt in the opposite direction from that shown in FIG. 8 for accommodating adjustment requirements.

The bedding can be custom fit as desired for a patient after the thigh support strips needed are selected and fastened in place.

The seat pan 144 may have a sleeve in the front that can be used to receive a support strap such as that shown at 90, to hold an additional support, such as a knee spreader, if desired.

While the pelvic support module 125 has been illustrated as having solid molded side, rear and lower walls, a frame for supporting the seat pan is all that is necessary. The angular adjustment of the seat pan can easily be accomplished. An open style framework is satisfactory with vertical members used in regions where the seat pan adjustment slots and support holes are shown.

Although the present invention has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention.

What is claimed is:

1. A modular structure for forming an orthotic seat comprising:

a pelvic support module, said pelvic support module having a base portion with upright side support walls, and a rear wall supported by the base portion;

a separate seat pan adjustably secured between the side support walls, the seat pan being adjustable about a first axis to permit tilting the seat pan about the first axis, the seat pan being adjustably tiltable about a second axis perpendicular to the first axis;

at least one fastener for securing the seat pan relative to the base portion in an adjusted position about the second axis;

at least one strut extending upwardly from the rear wall; and

a thoracic module adjustably mounted for vertical movement on the strut and including a thoracic support having a back portion supported on the strut and extending forwardly, spaced apart side thoracic wall portions integral with the back portion positioned to engage and support a user on the separate seat pan.

2. The seat of claim 1, wherein the at least one strut comprises a single strut mounted substantially along an upright central line of the pelvic support module, the thoracic support module being slidably mounted on said single strut, and means to secure the thoracic module at a desired location along the length of said single strut.

3. The seat of claim 1, and a cervical support mounted above the thoracic module for supporting a head of a user of the seat pan.

4. The seat of claim 3, wherein the cervical support is mounted on a portion of the single strut, the single strut extending upwardly beyond the thoracic module.

5. The seat of claim 1, and a foot support mounted onto the pelvic module for adjustable positioning relative to the seat pan of the pelvic module.

6. The seat of claim 1, including a bedding material mounted on the pelvic module for supporting a user, said bedding material being conformed to fit to a user.

7. The seat of claim 1 wherein the seat pan has uprightly extending, spaced side walls and a back wall, that fit inside uprightly extending pelvic module side walls and the pelvic module back wall, aligning apertures formed in the side walls of the seat pan and the side support walls of the pelvic module base portion, and fasteners in the apertures for permitting adjustment of the seat pan about the first axis and for securing the side walls of the seat pan and the side support walls of the pelvic module base portion together.

8. A modular orthotic seat comprising standard sized modules custom fitted to a user including:

a pelvic seat module having a rear wall and side walls supported on a base portion for supporting a user;

a second module adjustably mounted relative to the pelvic support module for adjustment in a vertical direction and including integrally formed, yieldable thermoplastic side wall members conformable to fit the curvature of a thorax region of a user;

a cervical-head support adjustably mounted above the second module for limited vertical adjustment relative thereto; and

a seat pan having uprightly extending spaced sidewalls, and a back wall integrally molded thereto, the seat pan having a bottom wall for supporting a user of the modular orthotic seat, the seat pan fitting within the side walls and rear wall of the pelvic seat module, and adjustable connections between the seat pan and walls of the pelvic seat module to permit tilting the bottom wall of the seat pan relative to the base portion of the pelvic seat module about two mutually perpendicular axes.

9. The seat of claim 8, and a strut providing for the adjustable mounting of the second module relative to the pelvic support module, said second module having a sleeve thereon that receives the strut, and means to permit adjustably securing the second module at a desired location along the strut.

10. A method of providing an orthotic seat for a user including the steps of:

providing a set of a plurality of different standard sizes of a pelvic support module having a base and a seat pan for a user of the orthotic seat, the seat pan being adjustably mounted to the base for adjustment about two mutually perpendicular axes;

providing a set of a plurality of different standard sizes of a thoracic support module for engaging a thorax of a user of the orthotic seat;

selecting from the standard sizes a pelvic support module and thoracic support module that are compatible for supporting a potential user;

adjustably mounting the pelvic support module and the thoracic support module together in a desired location to provide thorax support for a user seated on the pelvic support module;

adjusting the seat pan relative to the base about the two mutually perpendicular axes to a desired support location for a user of the orthotic seat; and

providing padding on the modules for fitting the anatomy of a user.

11. The method of claim 10 including the steps of providing lateral support walls on the thoracic support module, and forming the support walls to fit a user along the sides of the thorax.

12. The method of claim 11 including the steps of adding auxiliary padding for fitting a user in at least one of the modules.

13. The method of claim 10 including the step of adjustably positioning a foot support on the pelvic support module.

14. An orthotic seat comprising:

a pelvic support module, said pelvic support module having

a base portion, and wall portions on at least two sides thereof;

a separate seat pan supported on the pelvic support module; and

adjustable connections for supporting the seat pan relative to the wall portions of the pelvic support module to

permit inclining the seat pan about two mutually perpendicular axes, and releasable securing fasteners for securing the seat pan in selected positions individually about the two mutually perpendicular axes relative to a generally horizontal plane.

15. The seat of claim 14 wherein the seat pan has uprightly extending, spaced side wall portions and a back wall portion that fit inside the wall portions of the pelvic module, and fasteners selectively positioned in apertures in adjacent wall portions for securing wall portions of the seat pan and wall portions of the pelvic module together, with the seat pan in a selected position about the two mutually perpendicular axes.

16. The seat of claim 15 wherein the pelvic module includes substantially continuous sidewalls and a back wall molded as a unit.

17. An orthotic seat comprising:

a pelvic support module, said pelvic support module having a base portion including seat pan support portions;

a separate seat pan supported on the pelvic support module seat pan support portions;

the seat pan being adjustably secured to first seat pan support portions with a fastener to permit adjustably tilting and securing the seat pan about a first axis;

the first seat pan support portions providing a second axis of tilt for the seat pan perpendicular to the first axis; and

a releasable fastener operable between the base portion and the seat pan to releasably restrain the seat pan from tilting about the second axis.

* * * * *

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SPINAL TRACTION CHAIR.

APPLICATION FILED OCT. 8, 1919.

1,356,365. Patented Oct. 19, 1920.

2 SHEETS—SHEET 1.

Fig. 1.

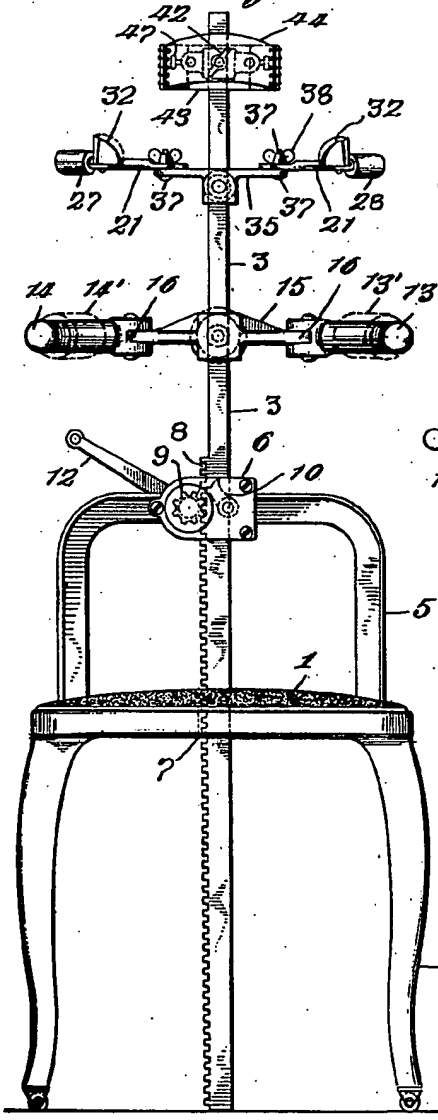
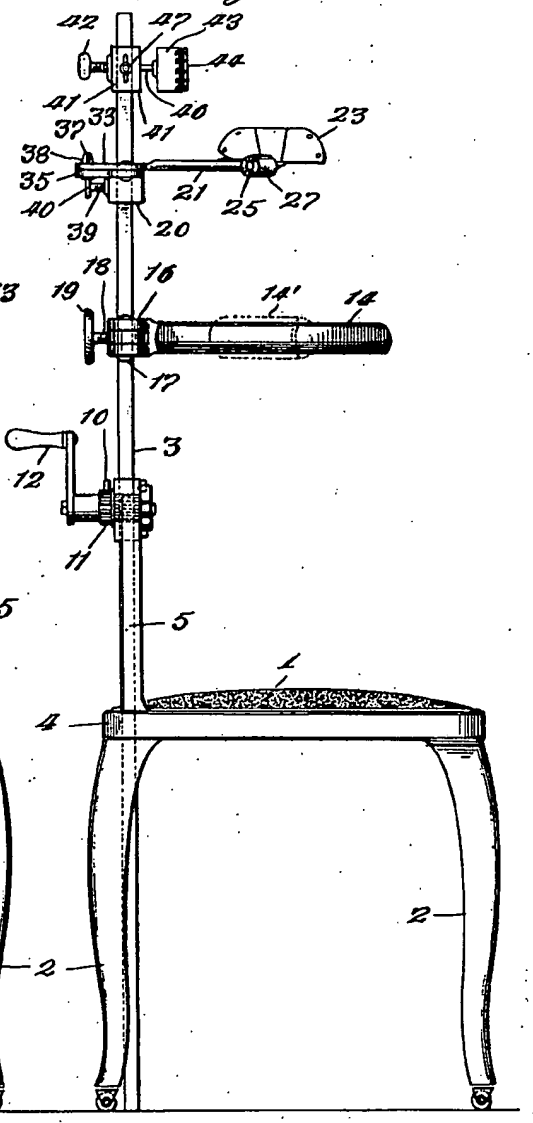


Fig. 2.



WITNESSES

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SPINAL TRACTION CHAIR.

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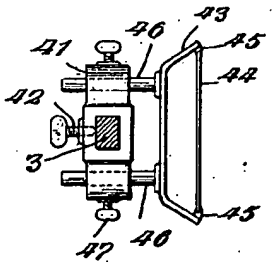
2 SHEETS—SHEET 2.

Fig. 3.



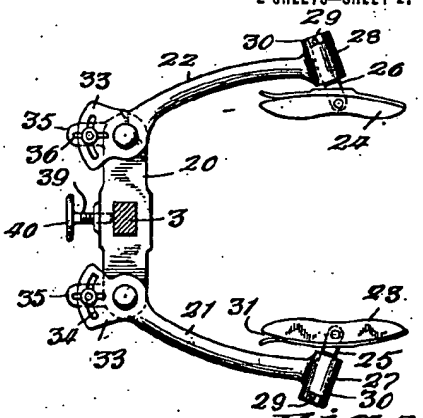
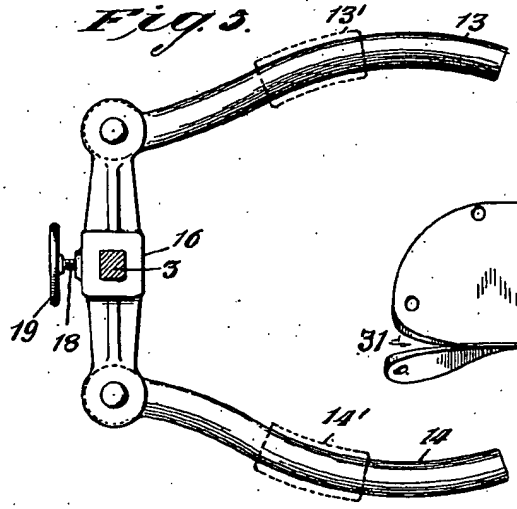


Fig. 4.

Fig. 5.



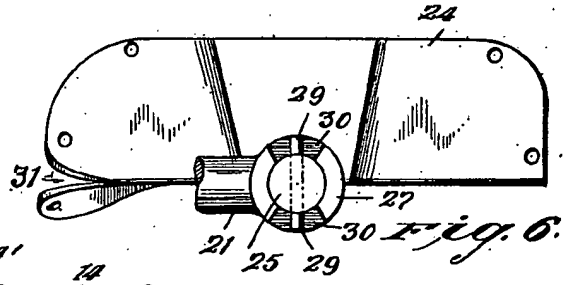
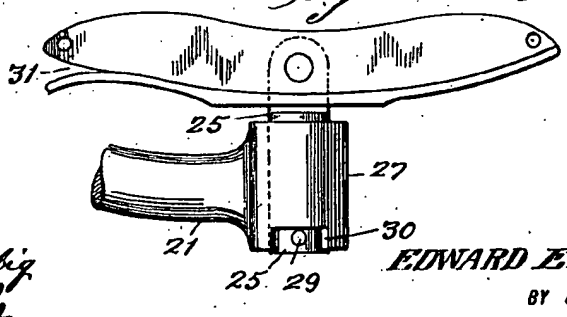


Fig. 6.

Fig. 7.



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SPINAL TRACTION-CHAIR.

1,356,365. Specification of Letters Patent. Patented Oct. 19, 1920.

Application filed October 8, 1919. Serial No. 329,284.

To all whom it may concern:

Be it known that I, Dr. EDWARD EVERETT HOSMER, a citizen of the United States, and a resident of the city of New York, borough of Manhattan, in the county and State of New York, have invented a new and Improved Spinal Traction-Chair, of which the following is a full, clear, and exact description.

This invention relates generally to a new and improved surgical chair, and more specifically to a chair known as a spinal traction chair which is particularly adapted to selectively stretch or extend different portions of the spine to separate the vertebra.

One of the objects of this invention is to provide a spinal traction chair of simple and rugged construction having adjustable devices thereon which may be selectively applied or adjusted to various portions of the body and head and a means of obtaining relative movement between said devices and the seat of the chair, so that different portions of the spine may be stretched.

A further object of this invention is to provide a chair having relatively few parts, and which is inexpensive to manufacture, which may be used by the practitioner without the necessity of the person operated upon having to first make preliminary operations before use.

A further object of this invention is to provide a device having adjustable means associated therewith which may be adjusted and applied to different parts of the person while occupying a sitting position, together with a means for mechanically actuating said device so as to stretch various portions of the spine, to separate the vertebra.

More specifically, one of the objects of this invention is to provide a spinal traction chair having a seat, a relatively movable back, and a means adjustable on a back, and a plurality of devices vertically adjustable on the back to different portions of the body and head so that by relative movement between the seat and back, different portions of the spine may be stretched or exercised at will.

In the practical embodiment of the invention shown, the device comprises a chair having a seat, a relatively movable standard extending upwardly from the back of the chair, and a suitable connection for obtaining relative movement, which in the form shown comprises a rack and pinion, a pawl being provided for the rack to hold the parts in any given position, and a handle being provided for actuating the pinion. A plurality of devices are adjustable on the standard, said device including an adjustable head support, an adjustable chin support, and an adjustable body support, each of which are adjustable vertically, and to conform to body and head characteristics of persons.

Other objects and advantages will be apparent from the following description and the accompanying drawings.

Similar characters and references designate like parts in the several views.

In the drawings showing a practical embodiment of the invention;

Figure 1 is a front elevation view.

Fig. 2 is a side elevation view.

Fig. 3 is a plan view showing in detail the head rest showing the standard in section.

Fig. 4 is a detailed plan view of the head and chin support, showing the standard in section.

Fig. 5 is a detailed plan view of the body support, showing the standard in section.

Fig. 6 is a detailed side view of the chin rest or support, showing a fragment of the arm.

Fig. 7 is a detailed plan view of the chin rest showing a fragment of the arm.

In the drawings showing a practical embodiment of the spinal traction chair, the invention is shown as comprising a seat 1, which may be of any suitable kind, and legs 2 for the seat. A relatively movable standard 3 is shown extending upwardly from one side 4 of the seat, a suitable frame 5 having a casing 6 mounted thereon which functions as a guide for the standard 3. The lower end of the standard passes through a slot 7 in the side of the chair. A suitable means comprising a rack 8 carried by the standard 3, and a pinion 9 rotatably mounted on the frame 5, is provided for effecting relative movement between the seat 1 and the standard 3. A pivoted pawl 10 engaging a ratchet 11 rotatable with the pinion, is provided to hold the seat and standard in any predetermined position. A suitable handle 12 is connected to the pinion in any suitable manner to rotate the same.

A body supporting means comprising a

plurality of arms 13 and 14 pivotally connected to the slide 15 vertically adjustable on the standard 3, is provided to support that portion of the body between the trunk and the shoulders. In the form shown, the arms 13 and 14 are slightly curved, to conform to the lines of the body, and are pivotally connected at one end with the slide 15 which slide is provided with forked ends 16 into which one end of the arm extends, a pin 17 or other suitable means extending therethrough to properly position the arms. The slide 15 may be adjustably positioned on the standard 3 by any suitable means, but in the form shown a screw 18 having a handle 19 is provided. By providing the adjustable body support, any portion of the spine, from the shoulders down, may be stretched, or exercised, by proper adjustment of the body support and manipulation of the actuating means producing relative movement between the standard and the seat. The arms 13 and 14 may be provided with any suitable covering 13' and 14'.

As a means of providing a support for the head, and for holding the head in any desired position, a plurality of devices are provided which are adjustably supported on the standard 3 the said device including a chin rest and a head rest, each of which are independently adjustable on the standard. The chin rest comprises a slide 20 having arms 21 and 22 pivotally connected therewith. As a means of readily and conveniently supporting the head at the chin, chin plates 23 and 24 are pivotally supported at one end of the rods 25 and 26 so that the said plates may revolve in a horizontal plane, the said rods in turn being rotatably supported in sleeves 27 and 28 arranged at the outer end of the arms 21 and 22 respectively. The rotary movement of the plungers is limited by a pin 29 passing through one end of the plunger, the end of the pin extending outward from the said plunger, and limiting the movement thereof by contacting with the sides of a slot 30 formed in the end of the sleeve. The chin plates 23 and 24 may be of any suitable form, and composed of any suitable material. In the form shown, they comprise a piece of angle iron bent and cut to a form to accommodate the chin. One end 31 of the plate is split so as to prevent the corners thereof from pressing on the throat. If desired, a cushion 32 made of any suitable material may be arranged on the chin plates. It is thus seen that the chin plates are adjustable in a horizontal plane and a vertical plane so that they are readily adjusted to different positions. If after the arms 21 and 22 and the chin plates 23 and 24 have been adjusted to their proper position on a person, it is desirable to maintain them in such a position, so for this purpose there is provided a means of holding the pivotal connected arms 21 and 22 in the adjusted position. In the form shown, this is accomplished by providing a fastening means between the arms 21 and 22 and the slide 20. In the form shown, the arms are provided with an extended portion 33 having a slot 34 therein, and the slide is provided with a lug 35 having a slot 36 therein. A bolt 37 extends through the slots 34 and 36, and is provided with a center nut 38 so that by tightening the wing nut, the arms 21 and 22 may be held in any given position. It is understood however that any suitable means may be provided for fixing the position of the arms. The slide 20 may be held in a vertically adjusted position on the standard 3 by a means similar to that provided for the body slide 15, by such for instance as a screw 39 and handle 40.

After the chin support has been properly adjusted to screw the proper distance between the seat and the chin for a particular person, it is then desirable to provide a means for holding the head in any desired position or at a certain angle. For this purpose, there is provided a head support comprising the slide 41 vertically adjustable on the standard 3 and held in any given position by a screw and handle 42 or other suitable means. As a means of providing a comfortable support or rest for the head, and to hold the head in any position desired, a cup or U-shaped member 43 is provided, having a flexible covering 44 extending across the open side thereof the said covering being connected to the sides by lacing 45 or in any other suitable manner. In order to effect a forward or backward movement of the head, horizontal adjustment of the head rest is effected by providing rods 46 connected to the head rest, and guided in openings formed in the slide 41. Any suitable means such as a thumb screw 47 may be provided to hold the head rest in properly adjusted position relative to the slide 41. It is to be understood that any suitable construction may be provided for the head rest so long as the proper provision is made for proper adjustment thereof.

In operation, the head support and the body support may be used either separately or together to separate the vertebra of the spine from the head or shoulders downward. It is thus seen that the device may be applied to selectively stretch different portions of the spine.

Particular advantage of a chair of this character is that a person may be operated upon to stretch or exercise various portions of the spine to stimulate circulation, with the clothing in position.

While but one practical embodiment of the invention has been shown herein, it is understood that various changes and modifi-

cations may be made without departing from the spirit and scope of this invention.

I claim:

1. In a device of the character described, a chair comprising a seat, a vertically movable standard at one side of the same, means arranged between the seat and the standard for effecting relative movement therebetween, an adjustable body supporting means connected to said standard, an adjustable head supporting means carried by the standard and universally adjustable chin supporting means carried by the standard.

2. A spinal traction chair comprising a seat, a standard extending upwardly therefrom, means arranged between the seat and the standard for effecting relative movement therebetween, and adjustable head and body supporting means connected to said standard whereby the spine may be stretched by the actuating means arranged between the seat and the standard.

3. A spinal traction chair comprising a seat, a standard extending upwardly therefrom, actuating means arranged on the seat and adapted to co-act with the standard for effecting relative vertical movement therebetween, and body supporting means vertically adjustable on the standard whereby different portions of the spine may be stretched by movement of the actuating means.

4. A spinal traction chair comprising a seat, an independently movable standard extending upwardly therefrom, means arranged on the seat and adapted to co-act with the standard for effecting relative movement therebetween, said means including a rack and pinion connection, and a plurality of devices vertically adjustable on the standard for supporting different portions of the body.

5. A spinal traction chair comprising a seat, an independently movable standard extending upwardly therefrom, means arranged therebetween for effecting relative movement between the seat and the standard, said means including a rack and pinion connection, and a plurality of devices vertically adjustable on the standard for supporting different portions of the body, said means including a body support comprising a plurality of arms, and a head support comprising a plurality of arms, and a chin rest for each arm.

6. A device of the character described comprising a seat, a relatively movable standard extending upwardly therefrom, an actuating means arranged therebetween, a head supporting means adjustable with respect to the standard, and a universally adjustable chin supporting means carried by said standard, whereby a person when seated in the chair with the head and chin supporting means properly adjusted may be treated by the separation of the vertebra upon movement of the actuating means.

7. A spinal traction chair, comprising a seat, an independently movable support or standard extending upwardly therefrom, an actuating means including a rack and pinion connection, and a handle for the rack arranged between the seat and the standard, a body supporting means adjustable on the standard, a plurality of devices including a body and a head supporting means adjustably mounted on the standard whereby different portions of the spine may be selectively stretched.

8. A spinal traction chair comprising a seat, a relatively movable standard extending upwardly from one side of the seat, a rack on the standard, a supporting frame connected to the seat, and functioning as a guide for the standard, a pinion rotatably mounted on said frame, and engaging the rack, a handle for said pinion, and a pawl for holding the pinion in any predetermined position, a body support adjustable on the standard, comprising a plurality of pivoted arms, a head support adjustable on the standard, comprising a plurality of pivoted arms, and a chin rest adjustable on each arm.

9. A spinal traction chair comprising a seat, an independently movable standard, a frame connected to the seat, and functioning as a guide for the standard, an actuating means carried by the frame, said means including a pinion, a rack carried by the standard, and engaging said pinion, a means engaging the pinion for holding the standard in any predetermined position, an adjustable head rest carried by the standard, means for retaining said head rest in its adjusted positions, and universally adjustable chin supporting means carried by said standard and co-acting with the head rest to provide means for properly supporting the head in various positions whereby upon movement of the actuating means a stretching of the spine and separation of the vertebra will be effected.

10. A spinal traction chair comprising a seat, a relatively movable standard extending upwardly from one side of said seat, supporting means carried by the seat for holding the standard in properly adjusted relative position thereto, actuating means arranged between the standard and the seat for adjusting the same, an adjustable head supporting means carried by the standard, said means including a head rest and a universally adjustable chin rest, and means for retaining the chin and head rests in their adjusted positions, whereby upon movement of the actuating means a stretching of the spine and separation of the vertebra is effected.

EDWARD EVERETT HOSMER.

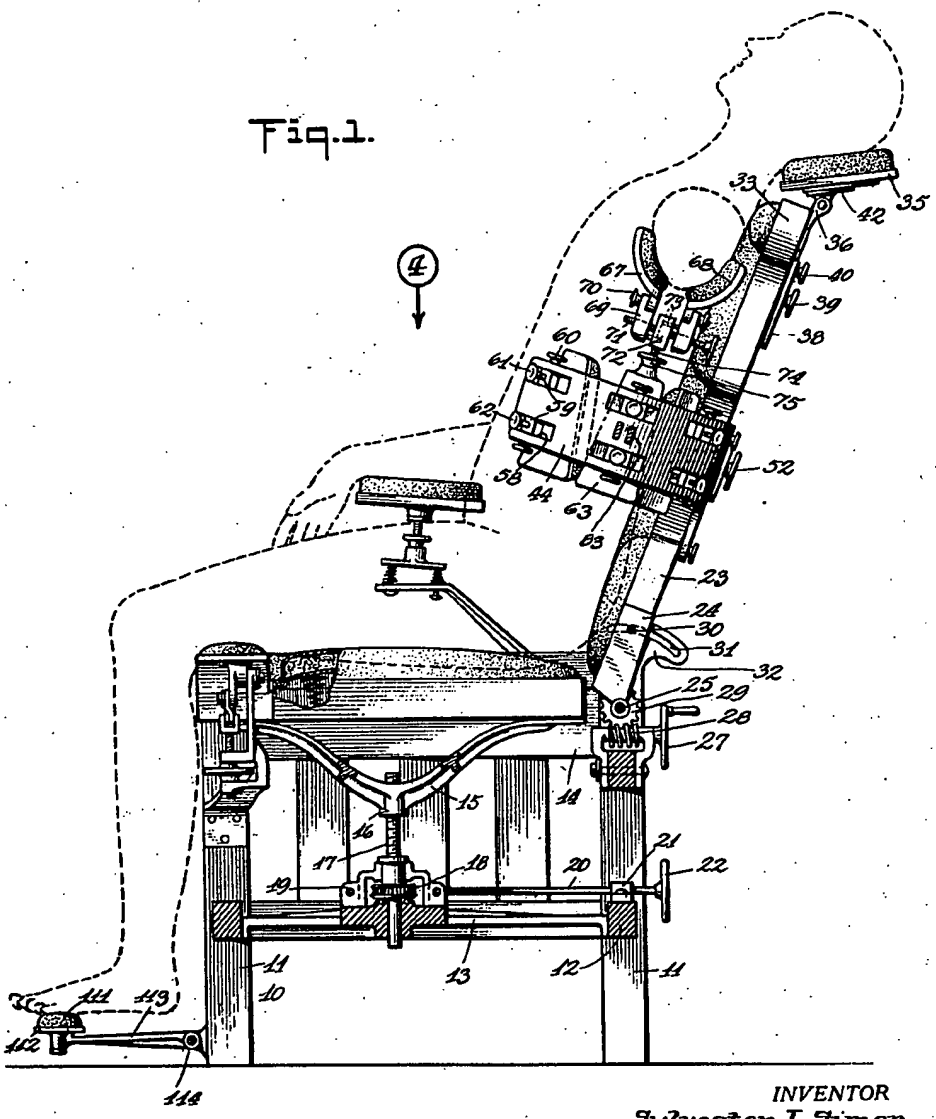
Feb. 24. 1925. 1,527,754

S. J. SIMON

RELAXATION CHAIR

Filed June 8, 1923 4 Sheets-Sheet 1

Fig.1.



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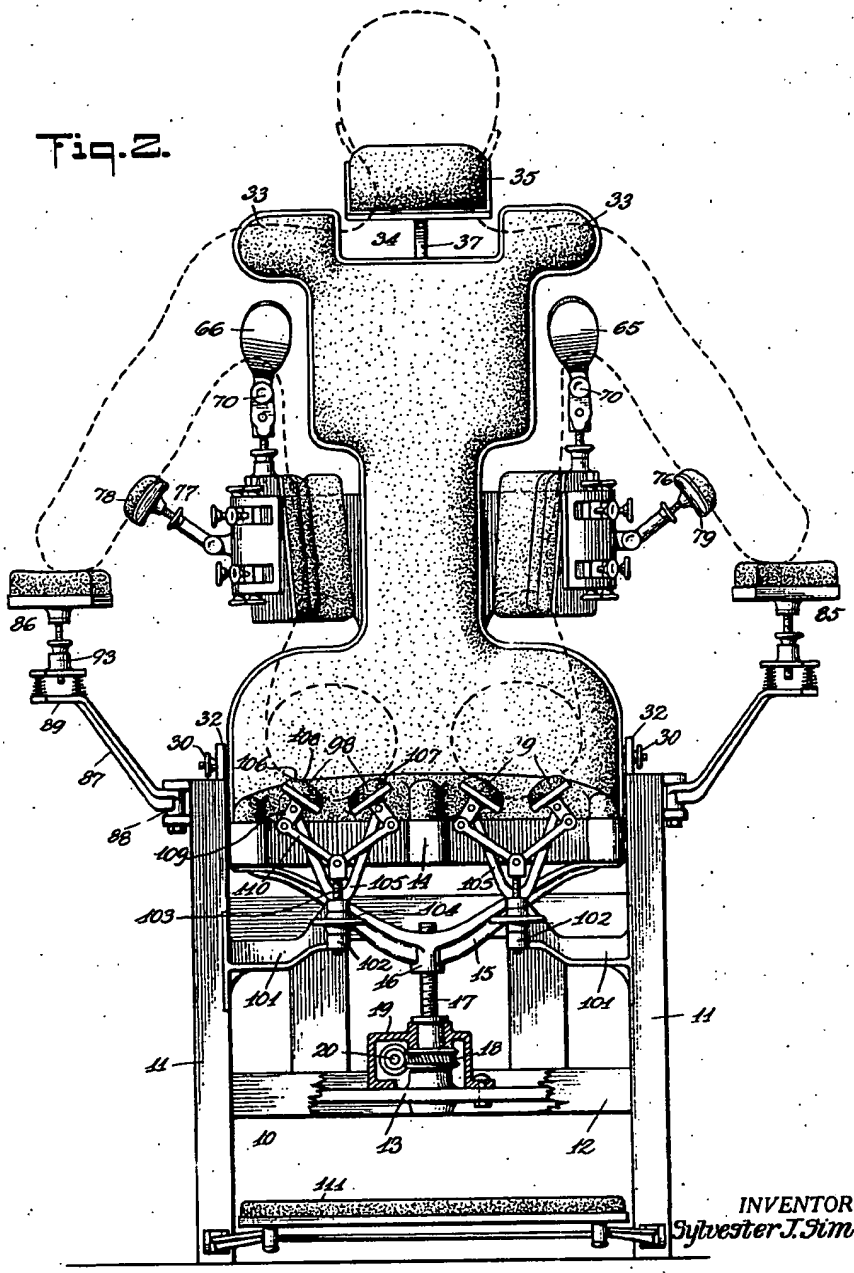
RELAXATION CHAIR

Filed June 8, 1923 4 Sheets-Sheet 2

Fig. 2.



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1,527,754

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RELAXATION CHAIR

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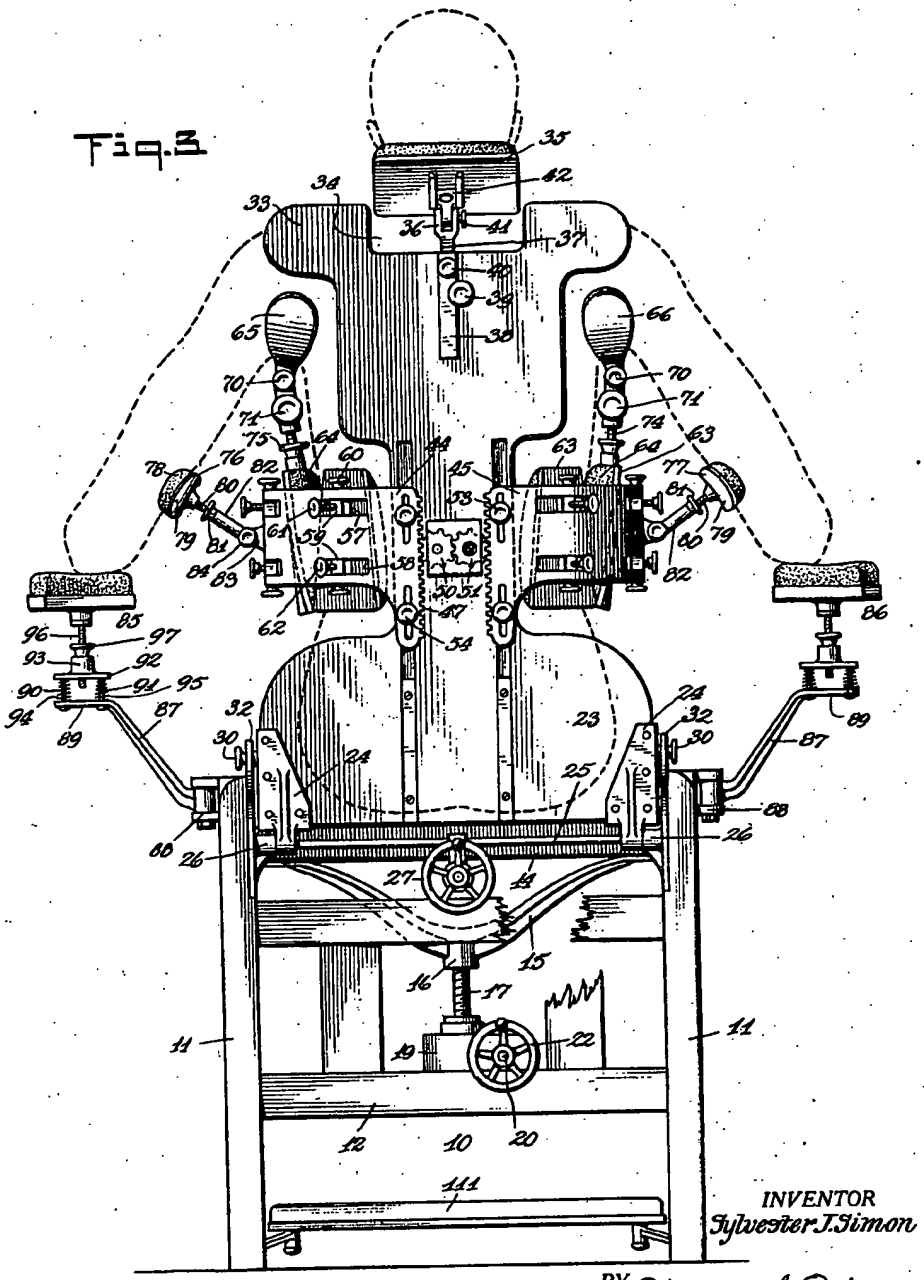
4 Sheets-Sheet 3

Fig. 3



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RELAXATION CHAIR

Filed June 8, 1923 4 Sheets-Sheet 4

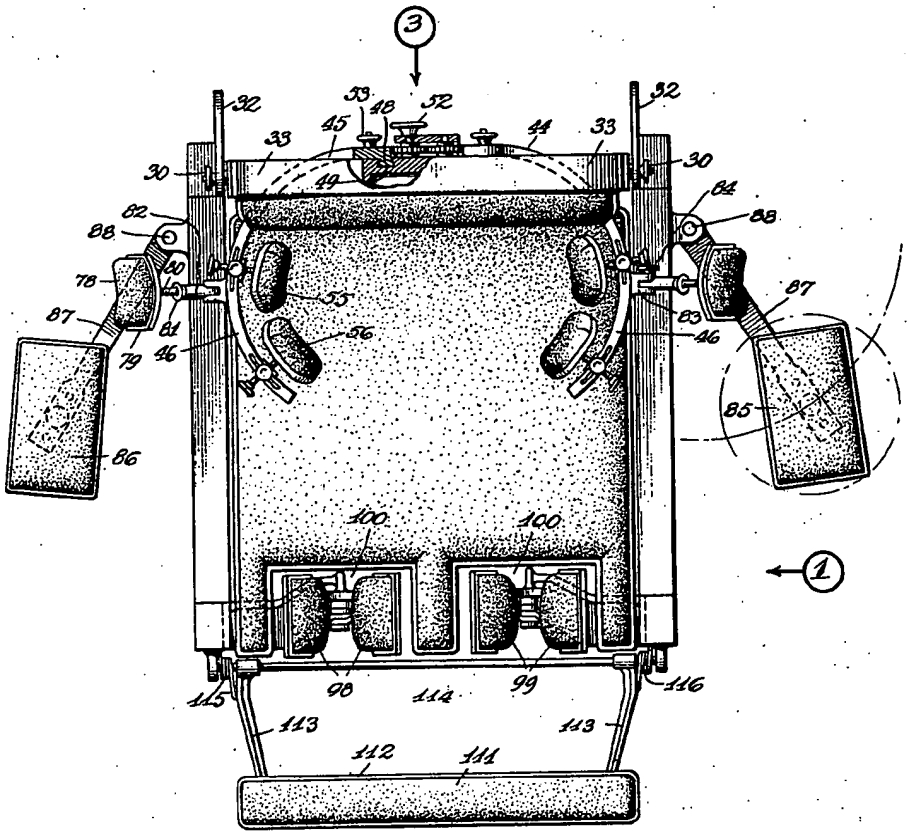

Fig. 4.

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UNITED STATES PATENT OFFICE.

SYLVESTER J. SIMON, OF NEW YORK, N. Y.

RELAXATION CHAIR.

Application filed June 8, 1923. Serial No. 644,128.

To all whom it may concern:

Be it known that I, SYLVESTER J. SIMON, a citizen of the United States, and resident of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Relaxation Chairs, of which the following is a specification.

The invention relates primarily to a physico-therapeutic method for relaxation and secondarily to a relaxation chair constituting a preferred instrumentality for practicing the method feature of the disclosure.

It is the usual practice in treating a person to produce relaxation for the skilled operator to flex the limbs in such a way as to place muscles which are usually under tension in a relaxed condition, or even to place them under compression, and on the contrary to place those muscles which are usually under compression either in a relaxed condition or under tension. In perfect relaxation, however, all nerve tracts must be without any compression and this also applies to circulatory systems, comprising the arteries, veins and sympathetics. The average practitioner in mechanical therapeutics follows a certain course of movements generally to effect an elongation of the several voluntary muscles and in this way acts to place the muscular system to a relaxed condition under what may be called a kinetic relaxation. Such treatment necessarily requires the services of a skilled operator and ordinarily relaxation cannot be obtained by the patients themselves due not only to the fact that the average person is not familiar with the necessary disposition of the parts of the body to effect a relaxation, but also due to the fact that the exertion necessary to effect a relaxing movement involves the expenditure of effort which is not conducive to relaxation. It is further appreciated that a person can relax by lying down or by reclining in a comfortable position and this inactive mode of relaxing will be referred to hereinafter as passive relaxation. However, simply lying down or reclining produces only a partial relaxation for all of the muscular system is not affected when the patient simply sits in a chair or reclines on a couch.

More specifically defined therefore the present invention relates to a refinement in the practicing of passive relaxation and a more complete relaxation looking to the attainment of certain reflex action at present attained only by the practicing of the kinetic manipulation method.

Accordingly the primary object of the invention is to provide a simplified and easily practiced method for passively placing a person under relaxation and which may be practiced by self-treatment.

Broadly, the invention is attained by disposing the person to be relaxed with the limbs flexed and supported in that position which provides the maximum degree of comfort and to distribute the weight of different parts of the body to supporting parts not usually employed for the purpose of supporting these body parts. For instance, the invention features the supporting or the partial supporting of the torso in such way as will allow for relaxation points at the articulations of the inter-costal, costal transverse and vertebral costal articulations, this in turn relieving pressure on the nerve ganglions at the inter-vertebral foramina, located between the individual vertebræ. In general the invention features the supporting of the body either through its skeleton frame structure or through rugged tissue capable of withstanding the pressure incidental to such distribution of weights on the located supports.

Another object of the invention is to modify weight distribution on the body gradually and thus minimize fatigue of the involuntary muscular effort to resist such change and to cause the weight to engage supports at those parts of the body where deleterious reaction is least likely to occur.

Accordingly, the invention features the disposition of the body so that the supports will be removed from arteries, connective tissue, nerve plexuses, and any organs which may be effected by pressure bearing on the same.

Referring to the physical aspect of the disclosure the primary object of the invention is to provide a simplified form of relaxation chair by means of which the method feature of the disclosure may be conveniently practiced.

Another object of the invention is to provide a relaxation chair, the different parts of which are adjustable, not only to fit different persons but also designed so as to be modified from time to time and thus modify the present position of the several

parts in order to respond to varying conditions after the chair parts have been set initially by the operator to fit a particular person. While adjustability in the several requisite directions for the several parts are thus featured, a feeling of rigidity in support of certain parts may lead to discomfort on the part of the patient, and accordingly, the invention features flexibility in certain of the supports.

Various other objects and advantages of the invention will be in part obvious from the statements of the method features and from an inspection of the accompanying drawings of a relaxation chair for practicing the method and in part will be more fully set forth in the following particular description of one form of mechanism embodying the physical aspects of the invention, and the invention also consists in certain new and novel features of construction and combination of parts hereinafter set forth and claimed.

In the drawings:—

Figure 1 is a view of a chair with the lower part in vertical central section from front to rear and the upper part is a view in side elevation coacting to illustrate a method of practicing passive relaxation and also to illustrate a preferred embodiment of the physical aspects of the invention and with parts broken away to show details of construction;

Figure 2 is a view largely in front elevation of the chair shown in Figure 1 and with parts broken away to show the seat elevator in section;

Figure 3 is a view in rear elevation of the, showing in the preceding figures; and

Figure 4 is a plan view looking down upon the chair and with parts of the torso frame at the back broken away.

In the following description and in the claims, parts will be identified by specific names for convenience of expression but they are intended to be as generic in their application to similar parts as the art will permit.

The lower portion of the chair comprises a rectangular frame 10 including upstanding corner-posts 11, horizontal braces 12, and a four arm cast iron spider 13, all coacting to provide a rugged, well-braced foundation for the chair. Guided for vertical movement within the upper portion of the frame is a cushioned seat 14. Fixed to the underside of the seat is a spider 15 which includes a threaded hub 16 in which works an elevating screw 17 journalled for rotary movement. The elevating screw is rotated through a worm drive 18 contained within a casing 19 secured to the spider 13 at the center thereof. The worm is actuated from a control shaft 20 extending rearwardly to the rear portion of the chair, mounted in journal blocks 21 and actuated from a conveniently disposed hand wheel 22 at the back of the chair. From this construction it will be understood that the seat is held from rotary movement by its guide provided by the chair frame and that the rotation of the hand wheel 22 in one direction will react through the worm drive and elevating screw to elevate the seat and the reverse movement will cause the seat to be gradually lowered. The worm drive has its intermeshing teeth disposed at such an angle that the seat is locked in adjusted position without necessity of using any separate locking means.

The chair is provided with a back 23, the lower edge of which is connected by means of hinge plates 24 to a hinge rod 25 mounted in bearings 26 formed on the inner faces of the two rear uprights 11, as more particularly shown in Figure 3. The back is tilted into rearwardly adjusted position by means of a hand wheel 27 on the shaft of which is mounted a worm 28 in mesh with a gear 29 secured to the rod 25 centrally thereof. The back is locked in its adjusted position by means of clamping screws 30 at opposite edges thereof engaging in segmental slots 31 formed in side plates 32 projecting upwardly from opposite sides of the frame. The portion of the back adjacent the waist of the occupant is cut-away to provide space for the extension of torso engaging members hereinafter described. Each upper corner of the back is provided with a pair of shoulder pieces 33 spaced apart to form a recess 34 for receiving a head-rest 35. The head-rest is pivotally connected by means of a hinge 36 with the upper end of a rack 37 slidably mounted in a guide-way 38 secured to the back below the recess. The rack is raised and lowered by means of a feed screw 39 and is locked in position by means of a jam nut 40. The head piece is locked in its rearwardly tilted position by means of a jam screw 41 and the head-piece is slidably mounted for bodily adjustment relative to the back by a sliding block guideway connection 42, with one of the hinge leaves forming the block locked to the head-rest by means of a set screw 43. From this construction it will be understood that the head rest may be adjusted both vertically and at an angle and may be locked in such adjusted position.

A pair of torso supporting frames 44 and 45 extend forwardly from the reduced portion of the back and are curved in opposite directions about the body of the occupant. As these frames are similar in construction a detailed description of either one will be sufficient for the other with obvious changes in construction to meet the requirements of a left and right body encircling engagement.

The frames each include a relatively deep curved plate 46 having its greatest dimensions vertically disposed so as to receive maximum pressure with the least possible use of material and in this way feature a light, readily movable structure. The back edge of each plate is provided with a rack 47 and is mounted for vertical movement in the back by means of a dove-tail projection 48 engaging in a slot 49 as more particularly shown in the broken away portion of Figure 4. The pair of racks 47 face each other and are geared so as to move in unison through the agency of a gear train including a pair of gears 50 and 51 meshing respectively with the racks 47. One of the gears is provided with a turn-wheel 52, so that the actuation of the single wheel will cause both gears to turn in unison to effect simultaneously either an elevation or a lowering of the torso supporting frames. When adjusted to their desired positions, considered vertically, the frames are locked to the back by means of jam-screws 53 and 54.

Each of the frames is provided with a plurality of torso engaging wedges of which two, 55 and 56, are shown in Figure 4. As these wedges are of similar construction and may be mounted wherever desired about the length of the frame, only one will be described. For the purpose of receiving the wedge the plate is provided with a pair of vertically spaced and longitudinally extending slots 57 and 58 (see Fig. 3). Mounted in the slots are sliding blocks 59 which are secured in locked position by jam bolts 60. Extending horizontally through the upper block 57 is a feed screw 61 pivotally connected at its inner end to the back of the wedge adjacent its upper end. Similarly a feed screw 62 extends through the lower block 58 and engages the back of the wedge adjacent its lower portion. Each of the wedges is formed of a rigid metallic back plate 63 and a front, cushioned, body-engaging face 64. These wedges are of greater width horizontally at their bottom portion and converges in width towards their upper edges. The cushioned face 64 is inclined downwardly and inwardly from the vertical and in general it will be understood that these wedges are designed to fit against and somewhat under the ribbed structure of the torso and are so disposed that, as the wedges are raised into engagement with the body, or when the seat is lowered, as hereinafter described, the wedges will bear gently against the ribbed structure and thus tend to support the upper portion of the occupant's torso at points spaced circumferentially from the vertebral column. From this construction it will be obvious that practically any variation in position may be provided for the wedging faces. It will be a usual practice for the operator in adjusting the chair to any particular person to select on the person that place or places where pressure can be most conveniently received, and then by manipulation of the several adjustments bring the several wedges into bearing engagement with the selected place or places. In adjusting the parts to some persons of frail structure, or to those who are peculiarly sensitive to any novel treatment, the wedge surfaces will be disposed almost vertical so as to minimize wedging pressure on the torso and in later stages of the treatments the wedges may be inclined with greater and greater angle to the vertical and in this way increase the wedging engagement with the body and gradually increase the proportion of weight carried by the back of the chair compared to the weight carried by the seat of the chair.

In order to minimize the proportion of torso weight supported through the ribbed structure of the patient, means are provided for directly supporting the axillæ. For this purpose there is provided a pair of adjustable shoulder joint supports 65 and 66 which engage under the axillæ and for this reason will be referred to hereinafter as axilla supports. As these supports are similar in construction, the description of either one will be sufficient for the other. It is intended that these supports be carried by the back so as to be movable therewith and this connection is most conveniently attained by utilizing one of the wedges on each side of the chair for the purpose of carrying the axilla rib supports. Each support (see Fig. 1) includes a pair of curved jaws 67 and 68 facing each other and designed to engage under the muscle structure defining the front and rear sides of the muscular construction of the shoulder joint leaving the axilla rib space free of engagement and in this way eliminating any pressure on the arteries and veins in the axilla space. Each of the jaws is pivotally connected to a screw block 69 and the jaws are designed to be secured in relatively adjusted position by means of a screw nut 70. The screw blocks are connected by means of right and left handed threads on a screw rod 71 extending through a supporting block 72. The screw blocks 69 are held from rotary movement by means of pins 73 extending into holes formed in the adjacent faces of the block 72. The block 72 constitutes the upper end of an elevating screw 74 threaded through an elevating nut 75 and extending upwardly from a support provided by the frame 63 of one of the wedges. It is apparent from this construction that the axilla support on each side may be adjusted first to fit the axilla on the occupant of the chair and then the supports when so adjusted, may be elevated relative to the torso engaging parts so that

the weight of the shoulders will be transmitted directly to the back of the chair and through parts sufficiently massive to transmit the strains without distortion.

While not necessary to the operation of the chair it is herein suggested that supports be provided for engaging the upper arm between the elbow and shoulder joint to be associated with the chair. For this purpose there is provided on opposite sides upper arm rests 76 and 77, preferably supported from the adjacent torso frames 44 and 45. The rests each include an outer cushioned face 78 from the supporting back frame 79 of which extends a screw rod 80. This rod is threaded through a feed nut 81 rotatably mounted in the outer end of an arm 82 pivotally connected by means of a lug 83 with the side of the torso supporting frame and secured in adjusted position by means of the jam nut 84. The outer face of the support is curved to substantially fit under the arm of the occupant and to extend transversely of the arm.

There is provided on opposite sides of the chair a pair of forearm supporting rests 85 and 86. These rests each include outstanding and upwardly extending brackets 87 pivotally connected to the sides of the chair by swivels 88. The upper free end of each of the brackets 87 is bent to provide a horizontally extending supporting plate 89. The plate is perforated to provide a pair of spaced apart apertures and through these apertures extend a pair of upwardly disposed bolts 90 and 91. These bolts engage at their upper end with the broad base 92 of a rocking member 93. Coiled springs 94 and 95 respectively encircle the bolts 90 and 91 and act to provide a resilient support for the rocking member 93. Extending through the rocking member is a threaded bolt 96 advanced vertically by means of a nut 97 to raise and lower the rest while maintaining the resiliency of the mounting for the same.

From this construction it is understood that the bracket may be swung bodily about its pivotal connection 88 to bring the arm rest below the position of the forearm with which it is intended to engage. The rest may then be elevated by the manipulation of the nut 97 so as to bring the cushioned face of the rest into desired bearing engagement with the located forearm. By means of the resilient mounting of the rest it is possible to provide a flexible support to the forearm which will have sufficient rigidity to support the weight of the forearm and at the same time will permit slight movement of the forearm while maintaining contact with the same and thus avoid any feeling of rigidity between the person's arm and the support therefor.

The seat is designed primarily to provide only a partial support for the buttocks of the occupant. It is the intent of this disclosure to provide a separate means to support the legs independently of the buttock and in this way provide for any desired angularity between the torso and the legs and to provide for relative angularity of the legs relative to each other when considered with relation to parallel vertical planes. For this purpose there is provided a pair of leg supports 98 and 99. As shown in Fig. 4 the front edge of the chair is broken away to provide a pair of transversely disposed recesses 100 for accommodating the leg supports. Here again the leg supports are similar in construction and the detailed description of either one will be sufficient for the other. The supports are each positioned on a bracket 101 extending inwardly from the adjacent front uprights of the frame. The bracket is provided at its inner end with a boss 102 in which is mounted a feed screw 103 movable vertically by a hand wheel 104. Fixed to the boss 102 is an upwardly extending U-support 105 to the upper ends of each leg of which is pivotally connected a pair of leg engaging cushions 106 and 107. The members each include a cushioned face 108 and a downwardly and outwardly extending arm 109 to the lower end of which is connected a link 110 pivotally connected to the upper end of the feed screw. From this construction it will be noted that the leg engaging members are spaced apart transversely in all positions of the same so as to engage the occupant's legs and the legs are so supported in spaced relation that no pressure is brought to bear on the popliteal and femoral arteries or the saphenous and femoral veins passing through the popliteal space. Moving the feed screw vertically will change the angular relation of the leg engaging cushioned faces of the supports and in this way insure a selective arrangement for engaging the occupant's legs.

It is further suggested in this disclosure that means be provided for engaging the feet of the occupant of the chair in the several adjusted positions of the legs, and preferably the engagement should be with sufficient intensity to provide a resilient support capable of supporting or partially supporting the weight of the foot and the lower part of the legs. For this purpose there is provided a foot rest 111 extending along the front and at the bottom of the chair. This rest includes a cushioned plate 112 supported by bracket 113 pivotally mounted upon a supporting rod 114 and actuated by coiled springs 115 and 116 which tend to elevate the foot rest.

In operation and following one approved practice in relaxing a patient, the person to be treated is positioned in the chair and

the back adjusted in position to give the desired angularity of tilt. This proper angularity will depend upon several factors, for instance, the desired apportionment of the weight between the back seat and torso supporting members as hereinafter described. The occupant of the chair is then clamped within the torso supporting members which are adjusted as previously described to provide for the desired intensity of engagement between the frame structure of the ribs and the several located wedging-supports.

As a person is peculiarly sensitive to pressure on the diaphragm, particular care is exercised in locating the wedges so as to provide for a comfortable and equally distributed pressure of the body weight and the wedges are so arranged that when the seat is lowered, as hereinafter described, there will be a slight tendency to elevate the upper portion of the body relative to the buttocks. The axilla supports having been adjusted to engage under the arms and the other parts adjusted, as indicated, the lowering of the seat will cause a slight tendency to raise the shoulders and in this way tend to release pressure of the shoulder weight on the lower portion of the body. While the chair is utilized in the course of treating a patient therapeutically, it will be a usual practice to modify the intensity of engagement with parts usually not utilized as supporting parts to the body and to increase the intensity of engagement as the treatment progresses and the parts of the body become used to the engagement therewith by the supporting parts of the chair. The head-rest may then be positioned in order to provide a comfortable position for the occupant of the chair. The occupant's arms are then exposed in the position where greatest degree of relaxation is felt, and the several upper and lower arm supports are adjusted in position to provide a desired intensity of engagement with the supported and adjusted parts of the occupant's arms. The leg supports are then adjusted vertically so as to give such an angularity to the upper part of the leg so that when the body is slightly lowered as hereinafter described, the proper angularity to attain maximum relaxation is provided. As the legs are elevated the spring controlling the foot rest follow the feet and maintains any degree of engagement therewith.

The final act of adjusting the chair consists in slightly lowering the seat. The effect of this movement will be to distribute the weight of the operator which would ordinarily be carried entirely by th back and seat. A portion of this weight is distributed to the other adjusted supports particularly to the torso supports.

The general effect of the occupant of the chair when so adjusted is to place the voluntary muscles of the limbs and arms under relaxation allowing perfect relaxation or rest, perfect circulation and a sedative nerve reaction, thus obtaining activity of the circulation. In general, it will be understood that the utilization of any of the parts or the omission of any of the parts is within the discretion of the operator who sets the chair to the patient and that parts herein shown to be adjustable may be secured in place where the chair is designed for some particular person.

It is noted that all of the body supporting parts are exposed in such a way that the engaged parts may be readily removed without necessity of moving any of the chair parts. The advantage of this construction is that after a chair has been set for a particular person, that person may repeatedly position himself in the chair with its previously adjusted parts and without necessity of resetting the chair for each treatment, or each period of relaxation.

While I have shown and described, and have pointed out in the annexed claims, certain novel features of my invention, it will be understood that various omissions, substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

Having thus described my invention, I claim:

1. In a relaxation chair, the combination of a vertically disposed supporting frame adapted to extend partially about one side of the occupant's torso, a torso engaging wedge supported by the frame, the face of the wedge which is designed to engage the torso being inclined downwardly and slightly inwardly from the vertical towards the occupant thereby to form a wedging engagement with the rib structure of the occupant's torso.

2. In a relaxation chair, the combination of a vertically disposed supporting frame adapted to extend partially about one side of the occupant's torso, a torso engaging wedge supported by the frame, the face of the wedge which is designed to engage the torso being inclined downwardly and slightly inwardly from the vertical towards the occupant thereby to form a wedging engagement with the rib structure of the occupant's torso and means for bodily elevating the wedge vertically into wedging engagement with the rib structure.

3. In a relaxation chair, the combination of a vertically disposed supporting frame adapted to extend partially about one side of the occupant's torso, a torso engaging wedge supported by the frame, the face of the wedge which is designed to engage the

torso being inclined downwardly and slightly inwardly from the vertical towards the occupant thereby to form a wedging engagement with the rib structure of the occupant's torso and means providing independent supports for the limbs, buttocks and head of the occupant.

4. In a relaxation chair, the combination of a supporting back, a torso frame in the form of a curved plate extending from the back and designed to partially encircle the torso of the occupant, said plate having its greatest dimension extending vertically to provide for maximum strength vertically with the least possible amount of material, the rear edge of said plate constituting a rack, a pinion coacting with the rack to provide a rack and pinion means for elevating the frame and a cushioned torso engaging member carried on the inner side of the curved frame plate.

5. In a relaxation chair, the combination of a supporting back, a torso frame in the form of a curved plate extending from the back and designed to partially encircle the torso of the occupant, said plate having its greatest dimension extending vertically to provide for maximum strength vertically with the least possible amount of material, the rear edge of said plate constituting a rack, a pinion coacting with the rack to provide a rack and pinion means for elevating the frame, said plate provided with a plurality of vertically spaced and horizontally extending slots, blocks slidably mounted in said slots, a cushioned torso engaging member and feed screws threaded through said blocks and engaging said member to adjust the same relative to the frame.

6. In a device of the class described, the combination of a vertically disposed torso frame, a torso engaging member provided with a wedge face and adjusting means between the frame and vertically spaced apart points on the member for varying the angularity of the wedge face relative to the vertical.

7. In a relaxation chair, the combination of a plurality of torso engaging wedges adapted to engage under the rib structure of the occupant and on opposite sides thereof, means for adjusting the wedge face of each of said wedges relative to each other, and a single control means for moving all of the wedges simultaneously into wedging engagement with opposite sides of the torso.

8. In a relaxation chair, the combination of a plurality of torso engaging wedges adapted to engage under the rib structure of the occupant and on opposite sides thereof, means for adjusting the wedge face of each of said wedges relative to each other, means for bodily adjusting the wedges relative to each other, and a single control means for moving all of the wedges simultaneously into wedging engagement with opposite sides of the torso.

9. In a relaxation chair, the combination of a vertically adjustable seat, a back, a torso supporting member carried by the back and vertically adjustable relative thereto, an axilla support carried by said member, movable therewith whereby the elevation of the member into operative engagement with the torso will simultaneously elevate the axilla support into its operative position.

10. In a relaxation chair, the combination of a vertically adjustable seat, a back, a torso supporting member carried by the back and vertically adjustable relative thereto, an axilla support carried by said member, adjustable relative thereto and movable therewith whereby the elevation of the member into operative engagement with the torso will simultaneously elevate the axilla support into its operative position.

11. In a device of the class described, the combination of a torso frame, a body engaging unit carried thereby, movable therewith and readily demounted therefrom, said unit comprising a torso engaging wedge for engaging under the rib structure of the occupant of the device, and an arm support adjustable relative to the wedge.

12. In a device of the class described, the combination of a frame, an axilla support mounted for vertical adjustment on said frame, said support comprising a pair of curved clamping jaws, adapted to receive the axilla therebetween, means for adjusting the jaws horizontally to fit beneath the axilla.

13. In a device of the class described, the combination of a frame, an axilla support mounted on said frame, said support comprising a pair of curved clamping jaws, adapted to receive the axilla therebetween, means for adjusting the jaws horizontally to fit beneath the axilla, the underside of said jaws being spaced apart to prevent the support from contacting directly with the axillary, brachial and also thoracic arteries and cephatic, brachial and bascilic veins.

14. In a device of the class described, the combination of a frame, an axilla support mounted on the frame, said support comprising a pair of curved jaws, means for adjusting the jaws relative to each other to and from their engagement with the underside of the axilla and means for adjusting the jaws relative to each other and about an axis extending parallel to their clamping direction.

15. In a relaxation chair, the combination of a seat, axilla supports for engaging under the axilla of the occupant, said supports being concaved and designed to engage the axilla on opposite sides of the arteries and veins in axillary space, said supports being adjustable relative to each

other to insure a fit under each axilla and means for locking th supp rts in adjusted position.

16. In a relaxation chair, the combination of a seat, means independent of the seat for supporting the torso of the occupant, and adjustable means for engaging each arm of the occupant at a plurality of points along the length of the arm.

17. In a relaxation chair, the combination of a back, a seat, a support for engaging the torso of the occupant, and an arm support carried by the torso support for positioning an arm of the occupant in fixed relation to the back, seat and torso support.

18. In a relaxation chair, the combination of a back, a seat, a support for engaging the torso of the occupant, an arm support carried by the torso support for locating and positioning an arm of the applicant in fixed relation to the back, seat and torso support and means engaging the torso support for simultaneously moving the same and the arm locating support.

19. In a relaxation chair, the combination of a back, a seat, a support for engaging the torso of the occupant, an arm support carried by the torso support for positioning an arm of the applicant in fixed relation to the back, seat and torso support and means for adjusting the position of the arm support relative to the torso support.

20. In a relaxation chair, the combination of a seat, a back, and a plurality of supports each adjustable relative to the other, said supports including an axilla support for engaging under and tending to support the axilla, another support adapted to be adjusted to engage under and support the upper arm and a third support for engaging under and supporting the forearm.

21. In a relaxation chair, the combination of a seat, a back, and a plurality of supports each adjustable relative to the other, said supports including an axilla support for engaging under and tending to support the axilla, another support adapted to be adjusted to engage under and support the upper arm, a third support for engaging under and supporting the forearm, and means for elevating the axilla and the upper arm supports simultaneously and independent of the forearm support.

22. In a relaxation chair, the combination of a horizontally extending support, a pair of vertically extending bolts passed loosely through the support, a nut carried by the bolts, springs on each bolt between the support and the nut acting to resiliently support the nut, and a forearm rest including a screw bolt threaded through the nut for vertical adjustment.

23. In a relaxation chair, the combination of a seat for supporting the buttocks of the occupants of the chair, a pair of supports for the occupant's legs, each support including a pair of parallel leg engaging members transversely spaced apart to engage the supported leg on opposite sides of the popliteal and femoral arteries, saphenous and femoral veins.

24. In a relaxation chair, the combination of a support, a screw vertically adjustable in said support, a pair of upwardly diverging arms pivoted to the screw, a pair of leg engaging members with their leg engaging faces inclined towards each other, one arm pivoted to the upper end of one of the leg engaging members and the other arm correspondingly pivoted to the other leg engaging member and an upstanding V-shaped frame secured at its base to the support having the upper end of one of its parts pivoted to one of the leg engaging members and the upper end of the other part similarly pivoted to the other leg engaging member.

Signed at New York city in the county of New York and State of New York this 5th day of June A. D. 1923.

SYLVESTER J. SIMON.

United States Patent [19]

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[11] **Patent Number: 4,623,194**

[45] **Date of Patent: Nov. 18, 1986**

[54] **BODY-SUPPORTING DEVICE FOR WHEELCHAIR FOR HANDICAPPED PERSON COMPRISING A STRUCTURE ALLOWING AN UPRIGHT POSITION**

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[73] Assignee: **International Diffusion Consommateur, France**

[21] Appl. No.: **612,916**

[22] Filed: **May 22, 1984**

[51] **Int. Cl.**[4] **A61G 5/00**

[52] **U.S. Cl.** **297/316**; 297/411; 297/429; 297/464; 297/488; 297/DIG. 10

[58] **Field of Search** ..... 297/316, 345, 411, 417, 297/429, 464, 466, 487, 488, DIG. 4, DIG. 10; 280/242 WC, 289 WC; 16/367

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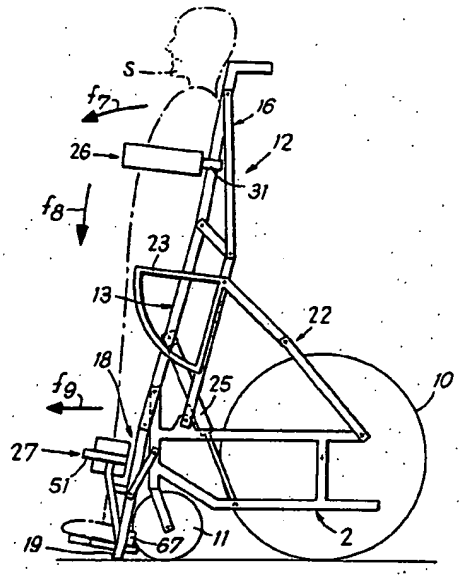
Primary Examiner—Francis K. Zugel
Assistant Examiner—Peter R. Brown
Attorney, Agent, or Firm—Bacon & Thomas

[57] **ABSTRACT**

The invention is concerned with assistance to handicapped persons. The body-supporting device for wheelchair for handicapped person is characterized in that it comprises: a first set of means comprising two rigid segments, each mounted on the backrest by an articulated system which blocks the segment in a vertical orientation as armrest or horizontal orientation as thoracic half-belt, and a second set of means comprising two cradel elements adapted to be immobilized in the same horizontal plane in alignment to form open leg guards fitting over the front of the subject's legs. The invention is applicable to wheelchairs.

9 Claims, 13 Drawing Figures



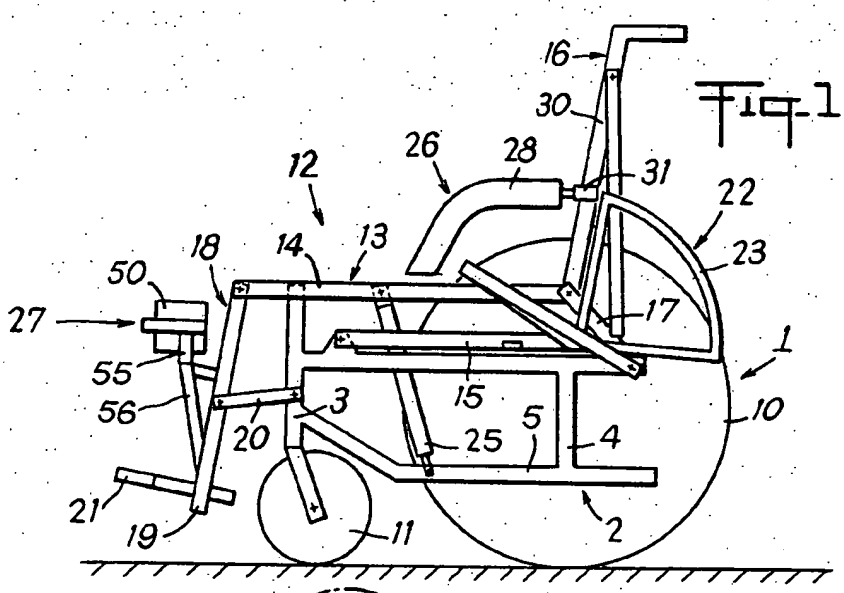

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Fig. 1

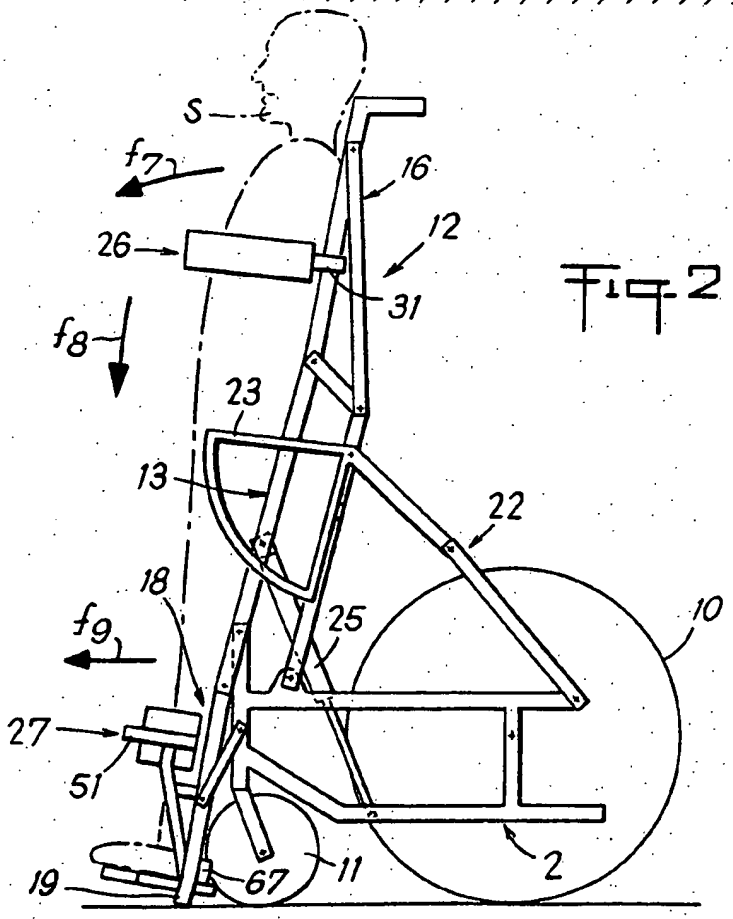
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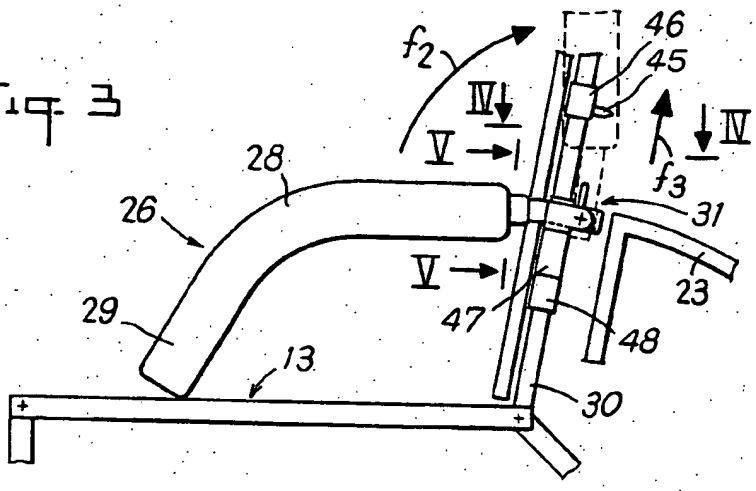
Fig. 2

Fig 3



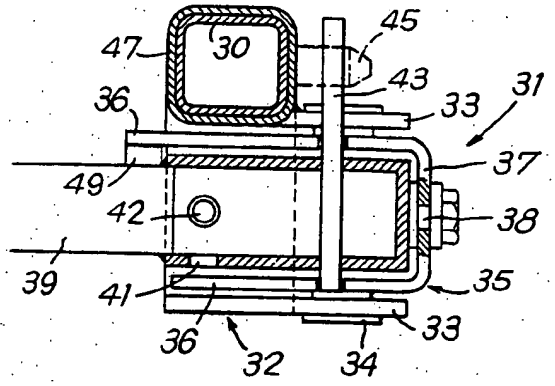


Fig 4

Fig 5

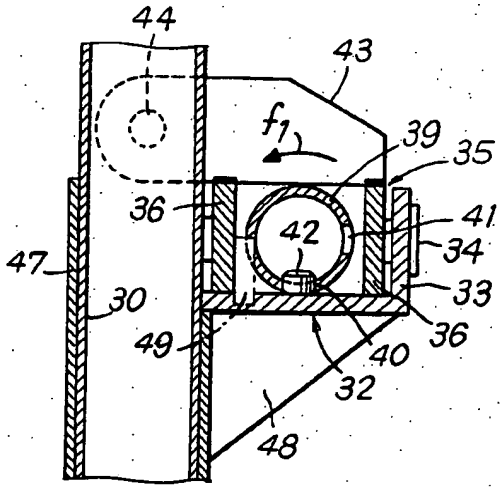


Fig. 6

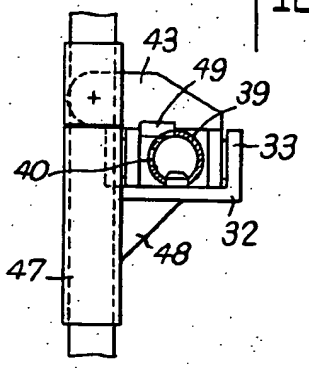
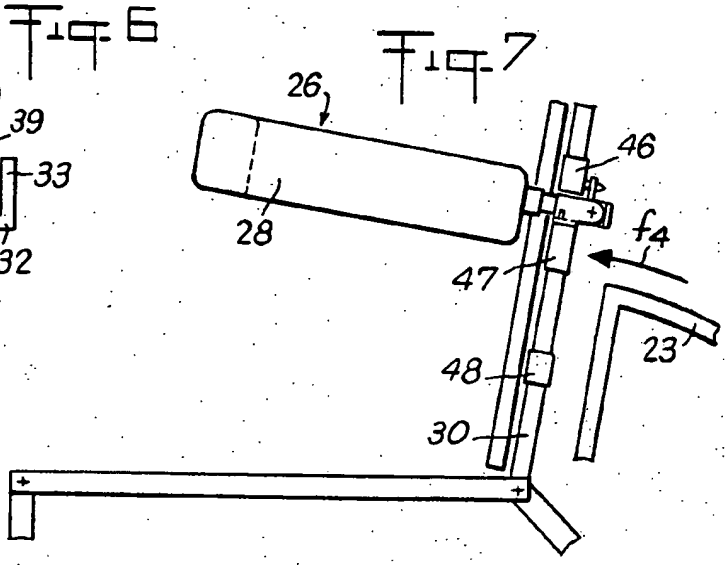


Fig. 7



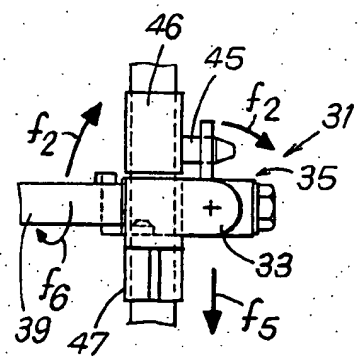
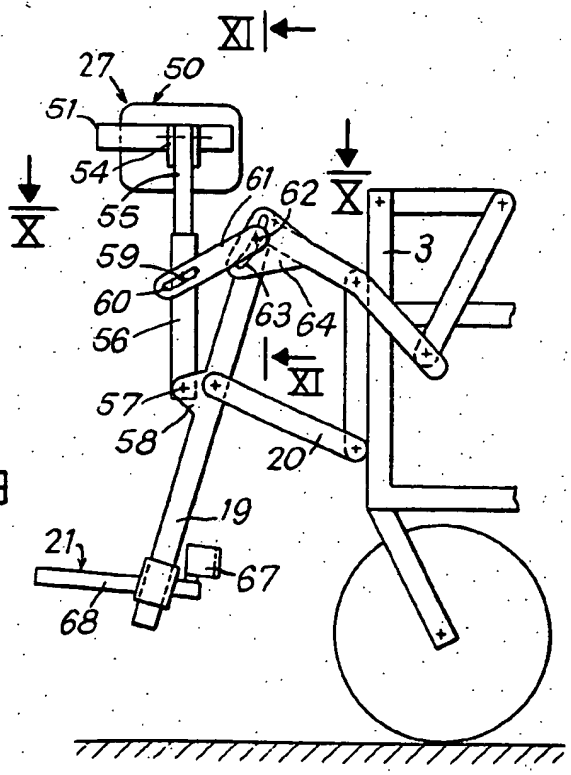


Fig. 8

Fig. 9



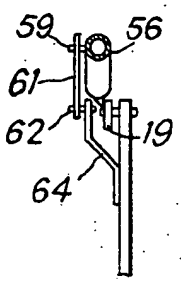
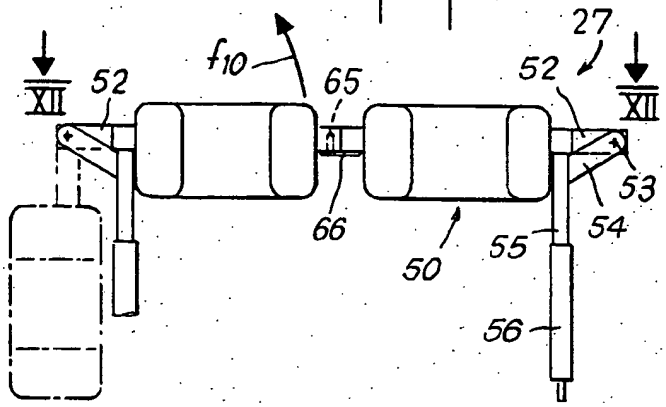


Fig 10

Fig 11



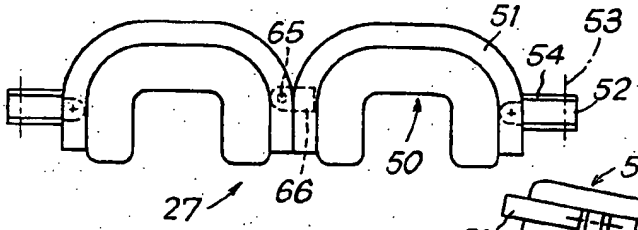


Fig 12

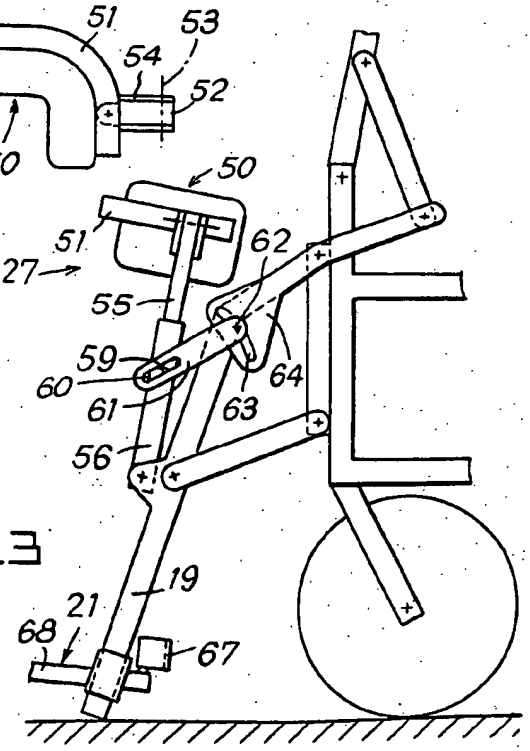


Fig 13

BODY-SUPPORTING DEVICE FOR WHEELCHAIR FOR HANDICAPPED PERSON COMPRISING A STRUCTURE ALLOWING AN UPRIGHT POSITION

The present invention relates to wheelchairs used by handicapped persons and invalids and is equally well applicable to folding or non-folding wheelchairs.

The invention relates more particularly to wheelchairs of the type comprising an articulated structure constituted by a backrest, a seat and a footrest associated with a drive member for assisting or controlling the raising or lowering of the articulated structure with respect to a bearing frame.

These wheelchairs incontestably represent real progress as, in addition to allowing indispensable mobility, they enable the subject to be in an upright position, which is also indispensable to avoid the physical degradations resulting from remaining in sitting position for a long period of time.

The prior known technique proposes a certain number of solutions for making wheelchairs comprising an articulated structure allowing upright position.

These different propositions have their advantages and their drawbacks, but they generally enable a subject to remain adequately in upright position, at least partially.

However, it has been observed that such wheelchairs could not be used by all handicapped persons or invalids. In fact, for certain handicaps or invalidities, the subject has insufficient, or no muscular control to remain in stable position against the upright supporting plane represented by the raised articulated structure of a wheelchair.

In such cases, the fact of being upright represents a real danger for the subject who, in the absence of self-control, risks falling by slipping sideways or by his legs weakening or his torso collapsing.

Now, the possibility of being upright is important for all handicapped persons or invalids and perhaps even more so for those who do not possess physical control as in the cases mentioned above.

It is an object of the present invention to solve this important problem by proposing a body-supporting device designed for wheelchairs for handicapped persons comprising an articulated elevator structure making it possible to constitute a supporting plane in sitting position or a supporting plane in upright position for a subject.

One object of the invention is to propose a body-supporting device which may be fitted on any type of articulated structure as long as the latter is constituted by a backrest, an armature and a foot-rest assembly subjected to combined relative displacements.

Another object of the invention is to propose a body-supporting device which may easiy be fitted on any type of wheelchair and easily used or positioned to perform the function of supporting the body when the subject is in upright position.

It is a further object of the invention to propose a body-supporting device of very small dimensions capable of performing the function of which it is intended without representing or constituting by its component elements a hindrance for the subject.

Another object of the invention is to propose a body-supporting device offering possibilities of adjustment as a function of the morphological characteristics of the subject.

A further object of the invention is to propose a body-supporting device which is simple, robust, reliable and which does not require any particular maintenance to be in a good operational condition.

To attain the above objects, the body-supporting device for wheelchairs for handicapped persons comprising an articulated elevator structure fitted on the frame of such a wheelchair and the type constituted by a backrest, by a seat articulated on the backrest and on the frame, by a footrest assembly articulated on the seat and the frame and by means for relative pivoting, is characterized in that it comprises:

a first set of means comprising two partly bent rigid segments, each mounted laterally on the corresponding upright of the backrest by an articulated system which holds and locks said segment

in a general vertical orientation in which it represents an armrest for a subject,

or in a general horizontal orientation in which it constitutes a thoracic half-belt for the subject,

and a second set of means comprising two cradle elements each mounted, by two pivot pins of orthogonal directions, on the front upright of the footrest assembly, said cradle elements being associated with means for relative immobilization in a position of alignment in which they constitute open leg guards fitting over the front of the subject's legs.

The invention will be more readily understood on reading the following description with reference to the accompanying drawings, in which:

FIGS. 1 and 2 are schematic views of a wheelchair comprising an articulated structure ensuring upright position and illustrating the device according to the invention for maintaining in two particular positions of use.

FIG. 3 is a side view showing one of the means of the invention in greater detail.

FIGS. 4 and 5 are sections taken, on a larger scale, along lines IV—IV and V—V of FIG. 3.

FIG. 6 is a transverse section, on a smaller scale, similar to FIG. 5, but illustrating another characteristic position.

FIG. 7 is a side elevation similar to FIG. 3, but illustrating the means according to the invention in another position of use.

FIG. 8 is a part side elevation showing, in greater detail, a functional relationship of certain of the elements of the first means of the invention.

FIG. 9 is a side elevation illustrating the positioning of another means of the body-supporting device.

FIG. 10 is a section taken along line X—X of FIG. 9.

FIG. 11 is a transverse view taken along line XI—XI of FIG. 9.

FIG. 12 is a plan view taken along line XII—XII of FIG. 11.

FIG. 13 is a side elevation similar to FIG. 9 but illustrating the same technical means in another position of use.

Referring now to the drawings, FIG. 1 schematically shows a wheelchair 1 comprising a frame 2 constituted by front uprights 3 and rear uprights 4 connected together by sills 5 and crosspieces 6 (not shown). The frame 2 is provided, in conventionally known manner, with bearing and driving wheels 10 and with swivelling guiding wheels 11. The above frame 2 corresponds to a wheelchair of rigid design but it is obvious that a folding

wheelchair has substantially the same form. In fact, in such a case, the crosspieces 6 (not shown) are replaced by equivalent foldable elements, of design known per se, enabling the frame to be maintained in the position of use or, on the contrary, enabling its dimensions in width to be reduced.

The frame 2 described hereinabove is fitted with an articulated elevator structure 12 adapted to allow a subject S to be in upright position. By way of example, structure 12 comprises a seat 13 comprising two lateral deformable quadrilaterals principally formed by two sills 14 and 15 articulated on the front part of the frame 2. The structure further comprises a backrest 16 constituted by two lateral trilaterals which are articulated on the sills 14 and 15 by means of two connecting rods 17 common to the sills 14-15. The articulated structure 12 is completed by a footrest assembly 18 principally formed by two lateral deformable quadrilaterals each including a front upright 19, a connecting rod 20, a part of the sill 14 and a part of the upright 3 of the frame 2. The assembly 18 supports one or two footrests 21 of known nature, preferably fitted with heel elements (not shown in FIGS. 1 and 2).

The articulated structure 12 is connected to the frame 2 by two manoeuvring assemblies 22 each comprising a lever 23 and an articulated system 24 for immobilizing, by geometrical locking, the articulated structure 12 in a stable sitting position or in a stable raised upright position. The manoeuvring assemblies 22 are completed by at least one drive member 25 such as a spring jack interposed between the frame 2 and for example the seat 13.

FIG. 1 shows the articulated structure 12 in the stable sitting position, immobilized by the articulated systems 24 of assemblies 22.

FIG. 2 shows the same articulated structure in stable raised or upright position, immobilized by the articulated systems 24. This FIG. 2 enables the relationship of articulation existing between the seat, the backrest and the footrest assembly 18, elevated by the manoeuvring assemblies 22 and the or each drive member 25, to be understood.

The object of the invention is to provide a device for ensuring body-support of a subject S, as shown in chain-dotted lines, brought into an upright position further to the elevation of the articulated structure 12. The object of the invention aims at making up for the lack or absence of physical control of the subject S to remain safely in the stable upright position illustrated in FIG. 2.

The body-supporting device according to the invention comprises a first set of means 26 adapted to be fitted on the backrest and a second set of means 27 adapted to be fitted on the footrest assembly 18.

The first set of means 26 comprises two rigid segments 28 presenting a bent or arched terminal part 29. Each segment 28 is mounted on the corresponding upright 30 of the backrest by an articulated system 31 described in greater detail with reference to FIGS. 4 and 5.

Each articulated system 31 comprises a fork joint 32 fitted on the upright 30 and forming two parallel flanges 33 extending towards the rear of the wheelchair. The flanges 33 support, by a substantially horizontal pivot pin 34, a stirrup 35 whose parallel arms 36 extend internally and parallel to the flanges 33. The web 37 of the stirrup 35 rotatably supports a pivot 38 fast with an extension 39 of the segment 28 and extending opposite the terminal part 29. The extension 39 presents two holes 40 and 41 of radial direction made to cooperate with a catch 42 projecting from the web of the fork joint 32. The holes 40 and 41 represent means for locking the extension 39 in rotation and are made so as to be able to maintain the plane of the segment 28 either in a substantially vertical orientation or in a substantially horizontal orientation after rotation in the direction of arrow f_1 in FIG. 5. The holes 40 and 41 are, in the present case, separated from one another, in consideration of the direction of arrow f_1 with respect to the fixed reference constituted by the catch 42, by an angular area equal to 270° C.

The stirrup 35 supports, from the upper edges of its flanges 36, a bar 43 which extends along a plane parallel to that of the backrest to be permanently disposed behind the corresponding upright 30 by being oriented towards the bar 43 of the homologous articulated system 31. The bar 43 comprises, in its terminal part facing the upright 30, a hole 44 adapted to cooperate with a finger 45 as shown in chain-dotted lines in FIG. 4.

Finger 45 extends from the upright 30 towards the rear and is borne, in the example of construction illustrated, by a ring 46 adjustably mounted on the upright 30. The ring 46 represents an upper stop for the articulated system 31 mounted in such a case so as to be free axially but immobilized angularly, for example, via a slide block 47 fitted on the upright 30. In such a case, the slide block bears the fork joint 32. The slide block 47 is limited in downward axial slide by a ring 48 with adjustable position, of the same type as ring 46.

Each articulated system 31 further comprises sensitive or tactile means for determining the position of locking of the segment 38. These means comprise a catch 49 added to the extension 39 so as to be able to cooperate with one of the flanges 36 of the stirrup 35 in register with the two locking positions established by cooperation of the catch 42 with one or the other of the holes 40 and 41. In the example illustrated in FIG. 5, the catch 49 is added so as to extend tangentially, presenting a thickness and a length determined so that it can cooperate with the flange 36 by a lateral face or by a transverse edge in one and the other position as will be seen from the following.

It should be noted that the hole 40 is made in the extension 39 so as to immobilize or lock the segment 28 in a substantially vertical plane in which the terminal part 29 is oriented downwardly in the direction of the seat 13.

The first set of means described hereinabove is used in the following manner:

In the cases of using the wheelchair according to FIG. 1, for which the articulated structure 12 offers a supporting plane in sitting position for a handicapped person or invalid, the two segments 28 are placed as illustrated in FIGS. 3, 4 and 5. The two segments 28 are thus maintained by cooperation of the hole 40 with the catch 42 in a substantially vertical plane in which the terminal parts 29 are oriented towards the seat 13.

In this state, each segment 28 represents an armrest as well as a lateral guard by extending between the backrest and the seat.

The position of each armrest is maintained without risk of untimely disengagement by the cooperation of the hole 40 with the catch 42, cooperation which is all the more consolidated as the segments 28 serve as armrests. No lateral displacement of the armrest 28 can occur in view of the angular immobilization of the fork joint 32 with respect to the upright 30, either directly or via the slide block 47.

If the articulated structure 12 is to be displaced in elevation in order to constitute a supporting plane for the subject S in upright position, each segment 28 is pivoted in the direction of arrow f_2 (FIG. 3) to rotate the stirrup 35 n pin 34 in order t disengage the h le 40 with respect to the catch 42. When this disengagement occurs, the segment 28 is rotated in the direction of arrow f_1 (FIG. 5) over an angular area which is determined by the catch 49. In the present case, the catch 49 is guided, after a rotation through 270°, in cooperation with the inner flange 36 as illustrated in FIG. 6. The subject or the user is therefore certain, by touching the stop, that the hole 41 is then placed in register with the catch 42. The segment 28 is then pivoted in the direction opposite to arrow f_2 so as to establish cooperation betwen the hole 41 and the catch 42 effecting locking of the segment 28.

In this state, the segment 28 is oriented substantially horizontally, perpendicularly to the plane of the backrest 16. The corresponding terminal part 29 is thus directed towards the second segment 28 and then represents a thoracic half-belt following the shape of or partially surrounding the chest of the subject who is held laterally and antero-posteriorly with respect to the backrest 16 when the two segments 28 have been brought into the above position.

The two half-belts pass around the chest, below the arm joints, this giving the subject who is immobilized against the backrest 16 complete freedom of movement.

In the preferred embodiment illustrated in FIGS. 3, 4 and 5, each segment 28 is in addition subjected, after the relative movements in the direction of arrows f_1 and f_2, to a vertical displacement in direction f_3 (FIG. 3) so as to bring the hole 44 in the bar 43 in approximate register with the finger 45 of the stop 46. This position is reached when the upper edge of the slide block 47 cooperates with the base of the ring 46. In this position, the segment 28 may be displaced in the direction opposite that of arrow f_2 so as to pivot, in the corresponding directon, the stirrup 35 which ensures engagement of the bar 43 by the hole 44 on the finger 45.

The segment 28 is then maintained as previously, but in an elevated position with respect to that occupied as armrest guard.

This presents the advantage of being able to adapt exactly to the desired position the level of the segment 28 in thoracic half-belt position by adjusting the ring 46. Such a possibility gives the subject maximum comfort as a function of his morphology.

FIG. 7 shows that the adaption of the segments 28 to the thoracic belt function is carried out prior to the elevation of the articulated structure 12. This Figure also shows that the adaptation of the segments 28 allows complete freedom of displacement for the manoeuvring assemblies 22 in the direction of arrow f_4 when the subject wishes, by manually acting on these assemblies, to initiate and assist the action of the driving member 25 or to control the action of the latter in order to control the relative movement of the elements constituting the articulated structure 12 with a view to bringing the latter from the position according to FIG. 1 to the position according to FIG. 2 in the upright state.

After return into sitting position, the subject can return each segment 28 into the armrest position by pivoting in the direction of arrow f_2 in order to disengage the bar 43 with respect to the finger 45. When such disengagement has occurred, the slide block 47 may be descended in the direction of arrow f_2 and simultaneously or thereafter the segment 28 rotated in the direction of arrow f_6 as is illustrated overall in FIG. 8. The return of the segment 28 into correct armrest/guard position is determined by bringing the lateral face of the catch 49 against the flange 36, as illustrated in FIG. 5, determining the register of the hole 40 with the catch 42. A pivoting in direction opposite to that of arrow f_2 makes it possible to pivot the stirrup 35 in order to obtain relative penetration of the catch 42 in the hole 40 reestablishing locking of the segment 28 in the original position.

Although the two segments 28 provide thoracic support for the subject S against the plane of the backrest 16, in certain cases, they are insufficient to effectively oppose a weakening of the lower limbs resulting from a total or partial loss of physical control thereof. It is for this reason that the body-supporting device according to the invention also comprises the second set of means 27.

FIGS. 9 to 12 show that the second set of means 27 comprises two open leg guards 50 which are adapted to fit over the front of the subject's legs, abutting substantially below the tibia in order to immobilize the lower limbs laterally and in the antero-posterior plane.

Each leg guard 50 is constituted by a cradle element 51 comprising an extension 52 which is articulated by a pin 53 on an offset fork joint 54 extending from the upper end of a cylindrical rod 55. The lower terminal part of the rod 55 is mounted to rotate inside a shaft 56 adapted to be fitted on one of the uprights 19 of the footrest assembly 18.

The shaft 56 is to this end articulated by a pin 57 on a tab 58 offered by the upright 19. The shaft 56 is maintained in a substantially vertical position by a pivot 59 provided in its upper terminal part to be adjusted in position inside an oblong slot 60 presented by a rod 61 for connection with the upright 19. The terminal part of the rod 61 opposite the slot 60 is provided with a pivot 62 mounted to be adjustable in position inside an arcuate slot 63 presented by a plate 64 extending laterally to the upper crosspiece constituting the corresponding lateral deformable quadrilateral connecting the footrest assembly 18 to the seat 13. For reasons of facility of presentation, the construction illustrated in FIG. 2 is different from that given in FIG. 1 as far as the connection between the footrest assembly 18 and the seat 13 is concerned. However, it appears that this difference concerns only the structure of the technical means, the function assumed by this connection being in both cases the same, i.e. the pivoting of the seat 13, urged by the driving member 25, brings about the combined displacement of the assembly 18.

The shafts 56 of the two leg guards 50 are mounted on homologous uprights 19 and the rods 55 are rotatably engaged so that the fork joints 54 are oriented towards the outside opposite each other. In this way, by pivoting on pins 53, the leg guards 50 may be placed laterally and on the outside as shown in chain-dotted lines or, on the contrary, may be returned substantially horizontally in mutual alignment facing the plane of the assembly 18 passing through the uprights 19. The leg guards 50 are maintained in mutual alignment by immobilization means comprising a hole 65 made in one of the cradle elements 51 and a lug 66 projecting from the cradle element 51 of the second leg guard.

In this way, it becomes possible to maintain the two leg guards 50 efficiently in a stable position in which they are maintained by the pins 53, by abutting on the

upper parts of the rods 55. In this position, the leg guards 50 fit over the legs of a subject S.

The shafts 56 are adjusted in relative position via the pivots 59 so as to adapt the position of the leg guards 50 in mutual alignment as a function of the morphology of the subject and in particular of the length of the femurs. This adjustment is effected in correlation with that of the positon of the pivot 62 so that, in the position of maximum elevation corresponding to the upright position as illustrated in FIG. 13, the two leg guards 50 fit over the front of the two legs without creating any unbearable strain and to immobilize them laterally and antero-posteriorly in combination with the support of the feet against the heel elements 67 borne by the footrest plane 68.

A comparison of FIGS. 9 and 13 will show that the oblong slot 60 and the arcuate slot 63 offer a possibility of adjusting the leg guards 50 in the two positions as a function of the morphology of the subject to give maximum comfort and to establish a lateral and antero-posterior support opposing any weakening or collapse in the upright position as shown in FIG. 2.

It goes without saying that the leg guards 50 are placed in position as illustrated in FIGS. 11 and 12 prior to the elevation of the articulated structure 12, so as to constitute a stop for the legs in the event of accentuated weakening of the knees during elevation.

The subject S, supported by the two sets of means 26 and 27, is consequently efficiently and comfortably immobilized against a tendency of the torso to sag in the direction of arrow f_7 or a tendency to collapse in the direction of arrow f_8 as a result of the knees bending and moving in the direction of arrow f_9.

The means 27 may be rapidly disengaged in the sitting position. In fact, it suffices to move the leg guards 50 successively in the direction of arrow f_{10} to pivot the cradle elements towards the outside, as illustrated in chain-dotted lines in FIG. 11.

If desired, it is also possible to remove the leg guards 50 rapidly by extracting the rods 55 with respect to the shafts 56.

The invention is not limited to the embodiment described and shown as various modifications may be made thereto without departing from its scope. Although this has not been shown, adjusting means may be provided between the shafts 56 and the rods 55.

What is claimed is:

1. A device for supporting the body of a handicapped person within a wheelchair of the type including an articulated elevator structure fitted on the frame of the wheelchair, a backrest having a pair of uprights, a seat articulated on the backrest and on the frame, a footrest assembly having a pair of front uprights and articulated on the seat and the frame, and means for relative pivoting, the device comprising:

(a) a first set of means including two partly bent rigid segments, each segment mounted laterally on a corresponding upright of the backrest by an articulated system which holds and locks the segment in either a generally vertical orientation wherein the segment defines an armrest or in a generally horizontal orientation wherein the segment defines a thoracic half-belt for the person;

(b) each articulated system including a fork joint supporting a stirrup by a substantially horizontal pivot pin, a pivot whose axis is substantially at right angles to the pivot axis connecting the web of the stirrup to an extension of the segment, and a catch borne by the fork joint for engaging within either one of two holes formed in the extension for immobilizing the segment in either the vertical or the horizontal orientation; and

(c) a second set of means including two cradle elements, each cradle element being mounted by two pivot pins of orthogonal directions on a corresponding front upright of the footrest assembly, the cradle elements including means for relative immobilization in a position of alignment wherein the cradle elements are in engagement over the front portions of the legs of the person.

2. The device of claim 1 wherein the holes provided in the extension are radially spaced from each other by an angle of about 90°.

3. The device of claim 1 wherein the stirrup includes a pair of flanges and each extension includes a stop catch cooperating with one of the flanges to permit the person to determine the positions of the segment.

4. A device for supporting the body of a handicapped person in a wheelchair of the type including an articulated elevator structure fitted on the frame of the wheelchair, a backrest having a pair of uprights, a seat articulated on the backrest and on the frame, a footrest assembly having a pair of front uprights and articulated on the seat and the frame, and means for relative pivoting, the device comprising:

(a) a first set of means including two partly bent rigid segments, each segment mounted laterally on a corresponding upright of the backrest by an articulated system which holds and locks the segment in either a generally vertical orientation wherein the segment defines an armrest or in a generally horizontal orientation wherein the segment defines a thoracic half-belt for the person;

(b) each articulated system including a fork joint borne by a slide block mounted on a corresponding upright of the backrest for free axial movement therealong between upper and lower adjustable stops, and a stirrup provided with a bar extending substantially horizontal and parallel to the upright, the stirrup including a hole provided in a terminal portion thereof for the relative engagement therein by a finger projecting from the upper stop; and

(c) a second set of means including two cradle elements, each cradle element being mounted by two pivot pins of orthogonal directions on a corresponding front upright of the footrest assembly, the cradle elements including means for relative immobilization in a position of alignment wherein the cradle elements are in engagement over the front portions of the legs of the person.

5. The device of claim 1 or 4 further including:

(a) a vertical shaft carried by each corresponding front upright of the footrest;

(b) each cradle element including a lower terminal part rotatably engaged in the vertical shaft;

(c) each vertical shaft including a horizontal pivot pin provided at a lower portion thereof;

(d) a rod articulated on the footrest assembly, the rod including an oblong adjustment slot at one end thereof; and

(e) the pivot at the upper part of the vertical shaft being engaged within the oblong adjustment slot of the rod.

6. The device of claim 5 further including:

(a) an upper cross piece connecting the footrest assembly and the seat;

(b) an offset plate including an arcuate slot carried by the cross piece; and

(c) the other end of the rod including a pivot engaged within the arcuate slot.

7. A device for supporting the body of a handicapped person within a wheelchair of the type including an articulated elevator structure fitted on the frame of the wheelchair, a backrest having a pair of uprights, a seat articulated on the backrest and on the frame, a footrest assembly having a pair of front uprights and articulated on the seat and the frame, and means for relative pivoting, the device comprising:

(a) a first set of means including two partly bent rigid segments, each segment mounted laterally on a corresponding upright of the backrest by means for holding and locking the segment in either a generally vertical orientation wherein the segment defines an armrest or in a generally horizontal orientation wherein the segment defines a thoracic half-belt for the person;

(b) a second set of means including two cradle elements, each cradle element being mounted by two pivot pins of orthogonal directions on a corresponding front upright of the footrest assembly, the cradle elements including means for relative immobilization in a position of alignment wherein the cradle elements are in engagement over the front portions of the legs of the person;

(c) a vertical shaft carried by each corresponding front upright of the footrest, each cradle element including a lower terminal part rotatably engaged in the vertical shaft, each vertical shaft including a horizontal pivot pin provided at a lower portion thereof and a pivot provided at an upper portion thereof, a rod articulated on the footrest assembly, the rod including an oblong adjustment slot at one end thereof, the pivot at the upper part of the vertical shaft being engaged within the oblong adjustment slot of the rod;

(d) an upper cross piece connecting the footrest assembly and the seat, an offset plate including an arcuate slot carried by the cross piece, the other end of the rod including a pivot engaged within the arcuate slot; and

(e) whereby the vertical shaft may be pivoted to a position such that the cradle elements support the person in an upright position.

8. The device of claim 7 wherein the means for relative immobilization of the cradle elements includes an aperture provided in one cradle element and a lug provided in the other cradle element, wherein the lug is engageable within the aperture.

9. The device of claim 7 wherein the articulated elevator structure of the wheelchair includes means for permitting the structure to define a supporting plane for the person in a sitting position and extendable to permit the person to assume at least a partially upright position.

* * * * *

United States Patent [19]

Takasaki

[11] **4,065,179**

[45] **Dec. 27, 1977**

[54] **NURSING CARRIAGE**

[76] Inventor: **Takao Takasaki**, No. 4920-2, Ooazahirano, Nichinan, Miyazaki, Japan

[21] Appl. No.: **743,599**

[22] Filed: **Nov. 22, 1976**

[30] **Foreign Application Priority Data**

Nov. 27, 1975 Japan 50-124737

[51] **Int. Cl.²** **A61G 1/02**

[52] **U.S. Cl.** **297/384**; 297/DIG. 4; 5/86

[58] **Field of Search** ..... 297/16, 335, 384, DIG. 4; 5/86, 81

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Primary Examiner—Francis K. Zugel

[57] **ABSTRACT**

A nursing carriage for supporting a body of an infant or a disabled person, having a base frame with casters, the body frame erected on the base frame, and a top frame fixedly mounted on the body frame. The carriage has a pair of embracing arms swingably supported on the body frame. The embracing arms can be locked in their respective embracing positions and have holding members which are displaceable inwardly upon application of a weight on the embracing arms to embrace securely the body of a baby or disabled person under his or her arms. The carriage further includes a seat swingably mounted on the body frame and centrally has an opening to allow the baby or disabled person to make discharges in the sitting position.

11 Claims, 6 Drawing Figures

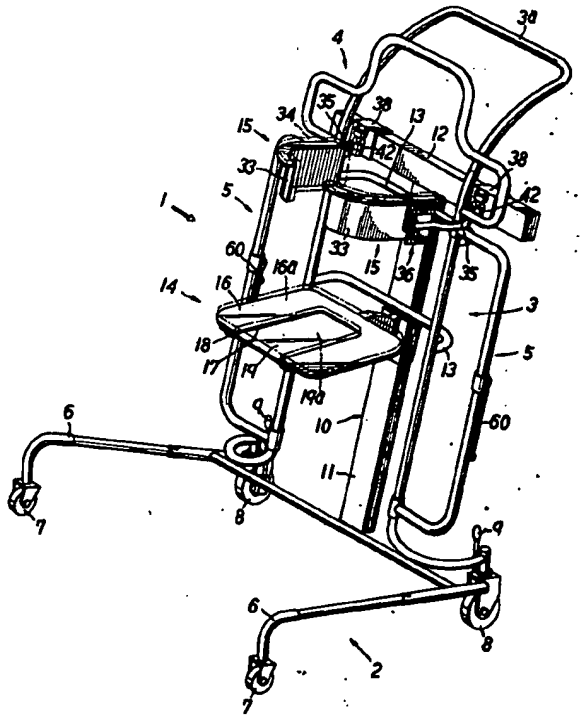

FIG.1

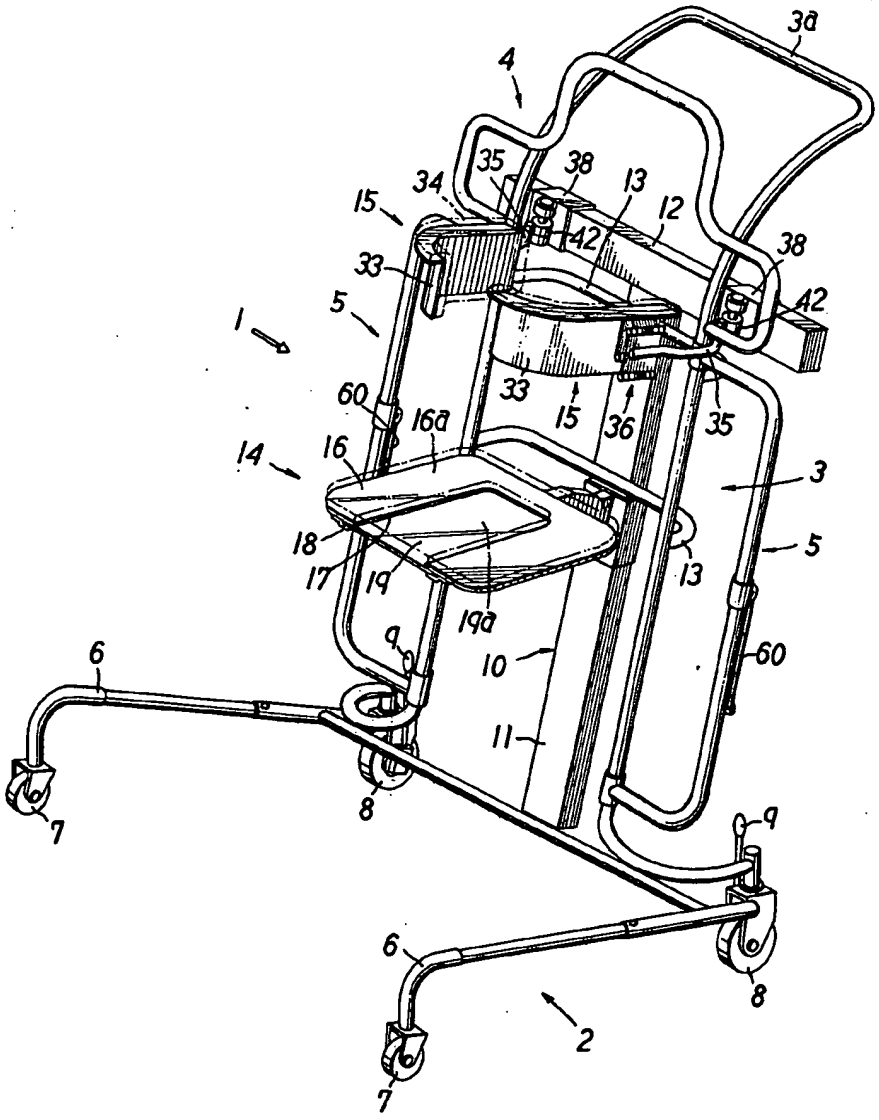
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FIG.2

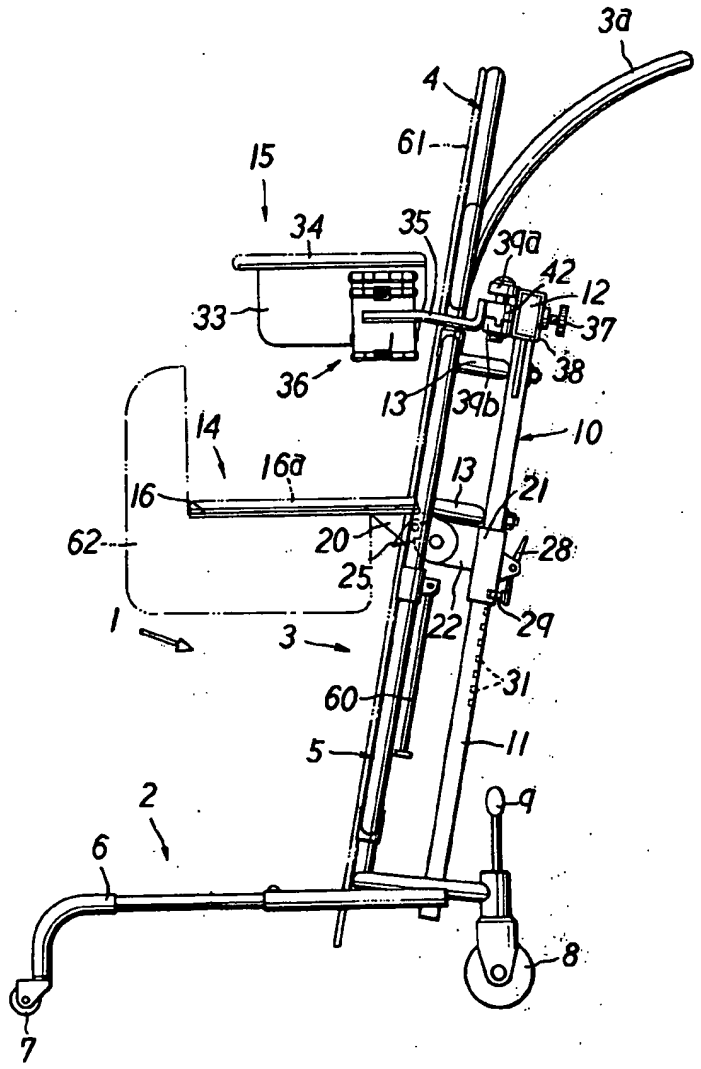
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FIG.3

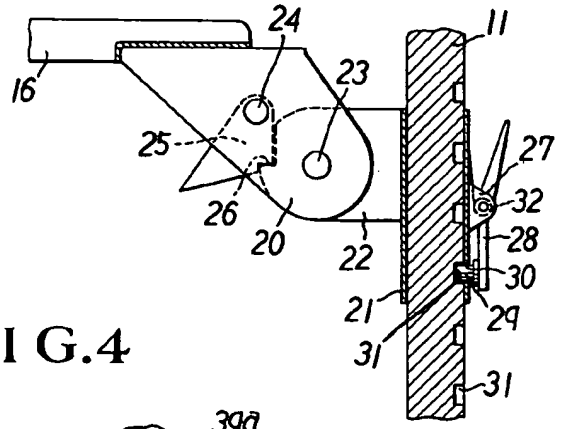


FIG.4

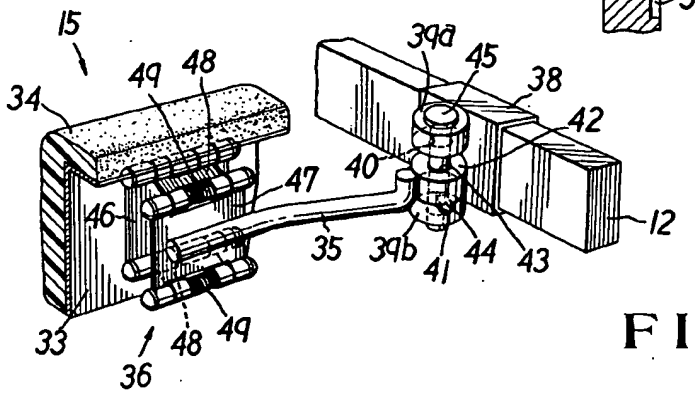


FIG.5

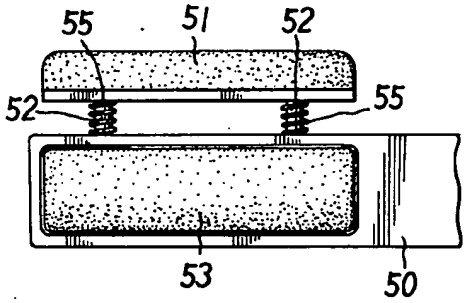
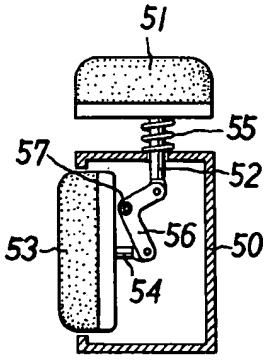


FIG.6



NURSING CARRIAGE

BACKGROUND OF THE INVENTION

This invention relates to a nursing aid, and more particularly to a nursing carriage which is adapted to support embracingly the body of an infant while changing diapers or during excretion or of a person who has lost freedom of movement due to senility or sickness.

Generally, it is easy to change, a baby's diapers or napkin when she or he is very young and lies on her or his back obediently without crawling around. However, as the baby grows up, she or he sometimes becomes fretful and resists with a greater force to make it diffucult to hold the baby's body while changing diapers. In addition, the one who takes care of a baby has to hold her or his body for a relatively long time during excretion.

The nursing requires more efforts when it comes to a grown-up disabled person who has a greater weight, and can be a great burden to a nurse who has to support the body of the disabled person while taking baths or meals or ejecting excrements.

The present invention has as its object the provision of the nursing apparatus which holds a body of an infant or disabled person safely and securely to lessen the burden of the nurse or the one who takes care of the baby or the disabled person.

It is another object of the present invention to provide a nursing apparatus which is provided with a pair of holding arms which embrace a baby or disabled person under his or her arms stably with a variable force depending upon the weight of the person to be carried.

It is still another object of the present invention to provide a nursing apparatus which is collapsible into a flat shape to receive a person lying on a bed and shiftable to carry and hold the person in an upright position.

SUMMARY OF THE INVENTION

According to the persent invention, there is provided a nursing carriage comprising in combination: a base frame having a pair of substantially parallel extending feet, each with a caster at the toe and heel ends thereof; a body frame having a substantially rectangular shape and erected on the base frame in a slightly reclined position; a T-shaped support securely mounted on the body frame and having a vertical column and a transverse beam; a seat swingably mounted on the vertical column of the T-shaped support; a pair of embracing arms swingably mounted on the transverse beam of the T-shaped support; an arm operating mechanism having means for locking their embracing arms in the respective embracing positions and means for displacing the embracing arms toward each other upon application of a weight thereon; a top frame mounted securely on the body frame at a position above the embracing arms; side frames attached at opposite sides of the body frame; and auxiliary legs swingably mounted on side frames.

The above and other objects, features and advantages of the invention will become apparent from the following particular description of the invention and the appended claims, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG. 1 is a perspective view of a nursing carriage according to the present invention;

FIG. 2 is a side elevation of the nursing carriage of FIG. 1

FIG. 3 is a diagrammatic view of a seat assembly;

FIG. 4 is a diagrammatic view of an embracing mechanism;

FIGS. 5 and 6 are a side elevation and a sectional view respectively illustrating a modification of the embracing mechanism.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to the accompanying drawings, and first to FIGS. 1 and 2, the nursing carriage according to the invention has a framework 1 of round pipes, including a base frame 2, a body frame 3 erected on the base frame 2, and a top frame 4 and side frames 5 which are attached to the upper portion and opposite sides of the body frame 3, respectively. The base frame 2 has L-shaped feet 6 at opposite sides thereof, each with a caster 7 at the toe end. The feet 6 telescopically extensible and preferably, may be locked in the extended position. The body frame 3 is securely mounted on the base frame 2 in a slightly reclined position, and has at the rearwardly curved, uppermost end a transverse frame 3*a* which serves as a handle. The lower ends of the body frame 3 are bent outwardly and securely connected to the heel ends of the feet 6, which are provided with casters 8, each with a braking mechanism which is actuated by a lever 9.

The body frame 3 has rearwardly projecting transverse pipes 13 for securely mounting thereon a T-shaped support 10 having a vertical column 11 and a transverse beam 12. The vertical column 11 of the support 10 mounts thereon a seat 14 which has a flat seat plate 16 with an opening 17 formed centrally to serve also as a commode seat. The opening 17 is normally closed by an auxiliary plate 19 which is detachably in engagement with grooves 18 formed around the marginal edges around the opening 17 of the seat plate 16. A cushion, for example, of sponge with a synthetic resin sheet cover, is removably placed on top of the seat plate 16 and the auxiliary plate 19. The transverse beam 12 of the support 10 swingably mounts thereon a pair of holding arms 15.

The seat plate 16 has securely fixed to the underside thereof brackets 20 which are pivotally connected through a pin 23 to brackets 22 of a support sleeve 21 which is vertically movably fitted on the column 11, allowing the seat 14 to swing toward the body frame 3 from the horizontal position of FIG. 3. The brackets 20 of the seat plate 16 have a pin 24 and pivotally support thereon a locking claw 25 which locks the seat 14 in the horizontal position by engagement with a stopper 26 which is mounted opposingly on the brackets 22.

The support sleeve 21 has on the back side thereof a pair of brackets 27 on which a locking lever 28 is pivotally mounted through a pin. The locking lever 28 has a locking projection 29 at the lower end thereof for engagement through an aperture 30 in the sleeve 21 with one of locking grooves 31 which are provided on the back side of the column 11 at suitable intervals along the length thereof, for locking the support sleeve 21 at a desired level on the column 11. The locking lever 28 is loaded with a spring 32 to hold the locking projection 29 securely in engagement with the locking aperture 30 and grooves 31. The height of the seat 14 can thus be varied as desired by shifting the positi n of the support sleeve 21 on the vertical column 11.

The holding arms 15 which are swingably mounted on the transverse beam 12 are covered on its upper and inner sides with soft cushioning material 34, for example, sponge wrapped in a flexible sheet such as of synthetic resin. The holding arms 15 have embracing members 33 which are curved inwardly at the fore ends thereof and connected at the rear ends to the transverse beam 12 through connecting rods 35. The rear ends of the connecting rods 35 are supported on sleeves 38 which are fit on the transverse beam 12. The sleeves 38 are normally fixed on the beam 12 by bolts 37 but they are shiftable along the beam 12 toward or away from each other by loosening bolts 37 to adjust the distance between the two holding arms 15. The sleeve 38 which supports the rear end of the connecting rod 35 is provided with a pair of vertically spaced brackets 39*a* and 39*b*, each with a bore 40 as shown in FIG. 4. The connecting rod 35 has an annular joint member 42 at the rear end, the joint member 42 having a bore 43 coaxially aligned with the bores 40 of the brackets 39*a* and 39*b*. The joint member 42 is provided with a radial projection 44 on the underside thereof for engagement with a radial groove 41 on the upper side of the bracket 39*a* to stop the holding arm 15 at suitable angles. The joint member 42 is movable along and at the same time rotatable about a pin 45 which is fixedly supported at opposite ends in bores 40 of the brackets 39*a* and 39*b*.

The fore end of the connecting rod 35 is provided with a fixed connecting strip 47, the upper and lower ends of which are swingably connected to a fixed connecting strip 46 on the holding arm 33 through connecting members 48 hinged on pins at the upper and lower ends of the connecting strips 46 and 47. The holding arm 33 is constantly urged upward by coil springs 49 which are mounted on the pins at the upper and lower ends of the connecting strip 47. As the holding arm 3 is pushed down by the weight of a baby or disabled person, the connecting members 48 are turned downwardly about the pins on the connecting strip 47, displacing the arms 33 inwardly toward each other to embrace the baby or disabled person securely under her or his arms. The embracing force of the arms 33 is determined by the springs 49.

FIGS. 5 and 6 show a modification of the arm operating mechanism, wherein the embracing arm has a box-like structure 50, an arm rest 51 and a holding member 53 which is mounted in an opening formed in an inner side wall of the box-like structure 50. The arm rest 51 is mounted vertically movably on the box-like structure 50 by a number of upright shafts 52. The lower end of each shaft 52 is extended into the box-like structure 50 and pivotally connected to one hand of an L-shaped link 56 which is pivotally supported at its elbow on a pin 57. The other hand of the L-link 56 is pivotally connected to a connecting strip fixed on the back side of the holding member 53. A coil spring 55 is interposed between the arm rest and the top wall surface of the arm 50 to urge the arm rest 51 upwardly. When the arm rest 51 is pushed down by the weight of the baby or disabled person against the action of the spring 55, the L-link 56 is rotated about the axis 57 to project the holding member 53, thereby securely embracing the baby or disabled person securely under his or her arms. In this instance, the embracing force of the arm 50 is determined by the strength of the springs 55.

The afore-mentioned side frames 5 are provided with auxiliary legs 60 at median points between their upper and lower ends. The auxiliary leg 60 is swingably supported at its upper end on a bracket which is fixed on the side frame 5. The auxiliary legs 60 are swung out to support the carriage in cooperation with the rear casters 8 and the top handle 3*a* of the body frame 3 when the carriage is laid down on its back. The openings defined by the body frame 3, top frame 4 and side frames 5 are covered with panels 61 which are preferred to have cushioning material on the front sides, such as sponge wrapped in synthetic resin sheet cover.

In order to use the nursing carriage for changing diapers of a baby, the carriage is laid down on its back and the holding arms 14 which have been adjusted to suitably spaced positions are swung apart. After throwing down the seat plate 16 flat on the body frame, a baby is laid on the panel 61 and the holding arms 14 are swung inwardly into the embracing positions to hold the baby under his or her arms by the holding members 33. As the carriage is raised to the upright position, the holding members 33 are displaced inwardly by the weight of the baby to embrace his or her body securely. Under these circumstances, it is easy to change the diapers as the baby who is carried under his or her arms cannot move violently.

If it is desired to let a baby or a disabled person sit on the seat 14, the seat plate 16 is swung out and locked in the horizontal position. To allow the baby or disabled person to make discharges in the sitting position, the auxiliary plate 19 and the cushion 19*a* are removed and a commode 62 is placed under the seat plate 16. In this connection, it is preferred to provide on the seat plate 16 means for detachably mounting the commode 62.

When throwing down or raising the carriage, it is preferred to apply brakes on the rear casters 8 to ensure facilitated and safe operation.

What is claimed is:

1. A nursing carriage comprising in combination:
   - a base frame having a pair of substantially parallel extending feet, each with a caster at the toe and heel ends thereof;
   - a body frame having a substantially rectangular shape and erected on said base frame in a slightly reclined position;
   - a T-shaped support securely mounted on said body frame and having a vertical column and a transverse beam;
   - a seat swingably mounted on said vertical column of said T-shaped support;
   - a pair of embracing arms swingably mounted on said transverse beam of said T-shaped support;
   - an arm operating mechanism having means for locking said embracing arms in embracing positions and means for displacing said embracing arms toward each other upon application of a weight thereon;
   - a top frame mounted securely on said body frame at a position above said embracing arms;
   - side frames attached at opposite sides of said body frame; and
   - auxiliary legs swingably mounted on said said frames.

2. A nursing carriage as defined in claim 1, wherein each one of said feet consists of a number of telescopically connected pipes.

3. A nursing carriage as defined in claim 1, wherein said seat is supported on a sleeve shiftably fit on said vertical column.

4. A nursing carriage as defined in claim 3, wherein said seat has a bracket on the underside thereof, said bracket being pivotally supported on said sleeve and pivotally supporting thereon a l cking member for en-

gagement with a stopper n said sleeve to lock said seat in a horizontal positi n.

5. A nursing carriage as defined in claim 4, wherein said seat centrally has an opening which is n rmally closed by an auxiliary plate.

6. A nursing carriage as defined in claim 5, wherein said seat has a cushion removably m unted thereon.

7. A nursing carriage as defined in claim 1, wherein each one of said embracing arms is swingably supported on said transverse beam through a connecting rod and a sleeve shiftably fit on said transverse beam, said connecting rod having at the rear end thereof an annular joint member pivotally supported on a bracket on said sleeve of said beam, said joint member having a locking projection for locking said arm in an embracing position by engagement with a groove on said bracket of said sleeve.

8. A nursing carriage as defined in claim 7, wherein said connecting rod is provided at the fore end thereof with a fixed connecting strip hingedly connected to a second fixed connecting strip on said embracing arm, said second fixed connecting strip being constantly urged upwardly by spring means.

9. A nursing carriage as defined in claim 8, wherein said embracing arms are covered with cushioning material at least on the upper and inner sides thereof.

10. A nursing carriage as defined in claim 1, wherein openings defined by said body frame, top frame and side frames are closed by panels covered with cushioning material at least on the front sides thereof.

11. A nursing carriage as defined in claim 7, wherein said embracing arm has a box-like structure and comprises an arm rest mounted on top of an upright shaft extending through an upper wall of said box-like structure, and a holding member mounted within an opening in an inner side wall of said box-like structure and connected to the lower end of said upright shaft through an L-shaped link pivotally supported at the elbow thereof within said box-like structure, said arm rest being constantly urged upwardly by spring means.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 4,065,179 Dated D cember 27, 1977

Inventor(s) Takao Takasaki

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 23, "39a" should read -- 39b --.

Column 4, line 59, "said" (second occurrence) should read -- side -- .

Signed and Sealed this

Sixth Day of *June 1978*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

DONALD W. BANNER
Commissioner of Patents and Trademarks

United States Patent [19]

Hammersburg

[11] **4,073,537**

[45] **Feb. 14, 1978**

[54] **UNIVERSAL SUPPORT PADS FOR WHEELCHAIR**

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[21] Appl. No.: **725,692**

[22] Filed: **Sept. 23, 1976**

[51] Int. Cl.[2] A62B 35/00

[52] U.S. Cl. 297/384; 297/DIG. 4

[58] Field of Search ..... 297/384, 411, DIG. 4, 297/427; 128/227; 280/644; 248/279, 287, 288, 289; 269/322, 328

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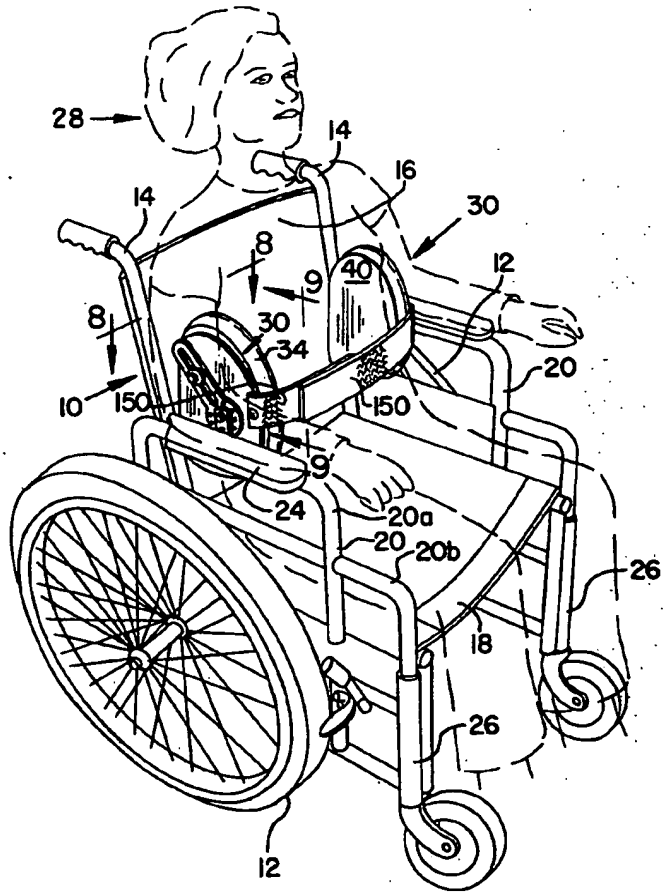
Primary Examiner—James T. McCall
Attorney, Agent, or Firm—Kolisch, Hartwell, Dickinson & Stuart

[57] **ABSTRACT**

A device for positioning a patient in a chair having a back and arms. The device includes a pad for placement against the patient and a clamp which underlies an arm of the chair and is shiftable along the length of the arm independently of the back. The pad is connected to the clamp by a series of connecting members which permit universal swinging of the pad about a plurality of angularly disposed and laterally spaced axes. The pad also is mounted for shifting laterally of the attaching clamp and the arm to which it is attached and for shifting vertically and horizontally forwardly and rearwardly relative to the chair. Locking mechanism is provided for securing the pad in any of the infinitely selectable positions for the pad to maintain patient positioning within the chair. A similar pad attached to the opposing arm on the chair also may be used to aid in patient positioning.

14 Claims, 9 Drawing Figures



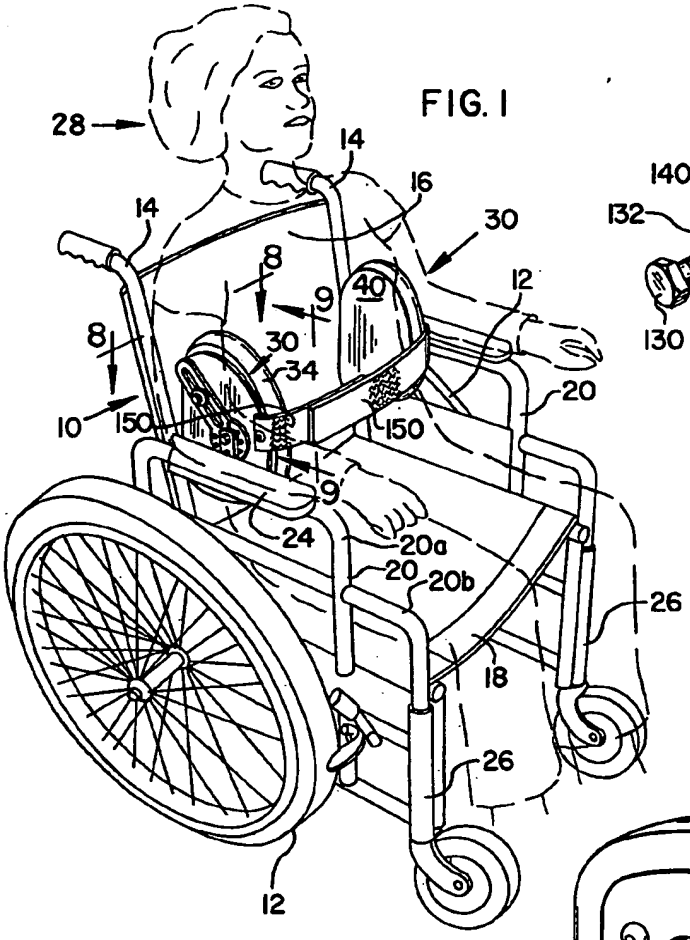


FIG. 1

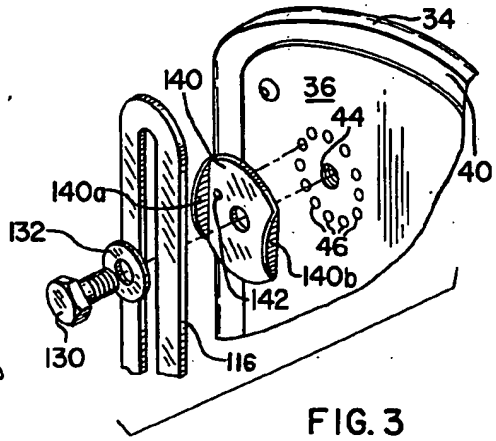


FIG. 3

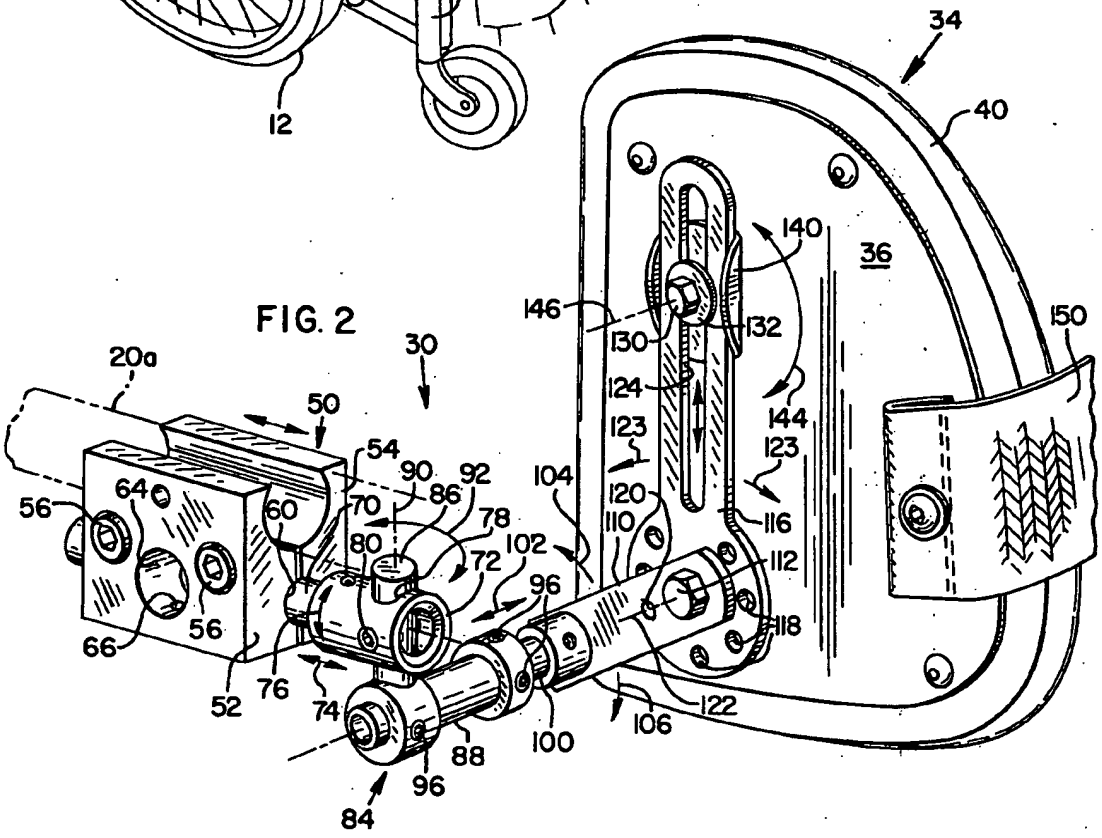


FIG. 2

FIG.4

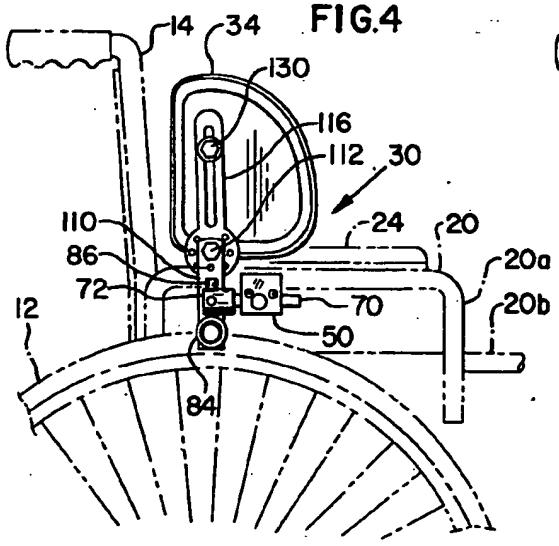


FIG.5

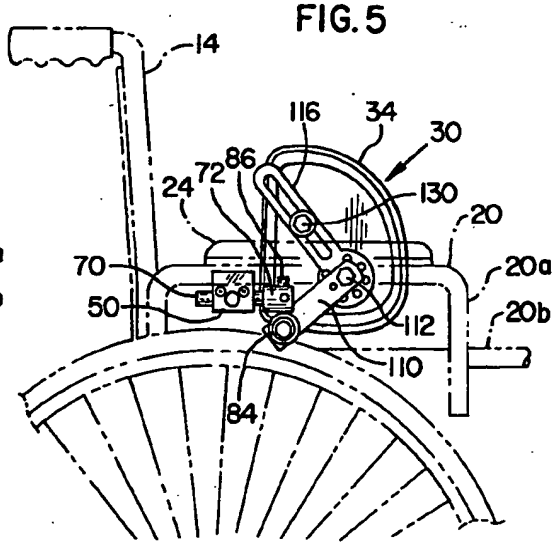


FIG.6

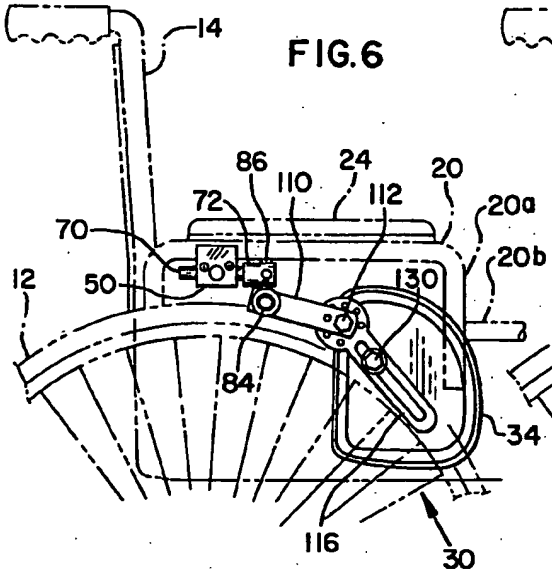
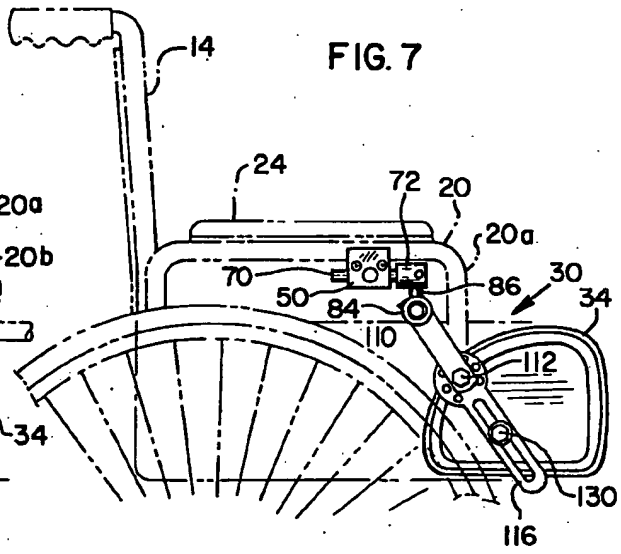


FIG.7



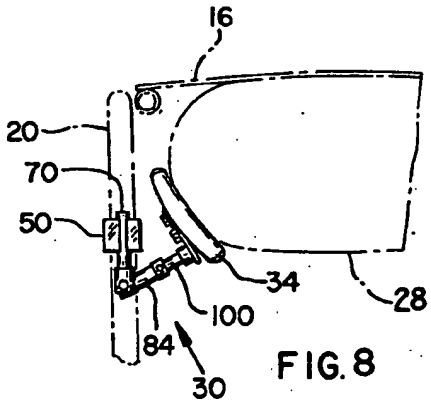


FIG.8

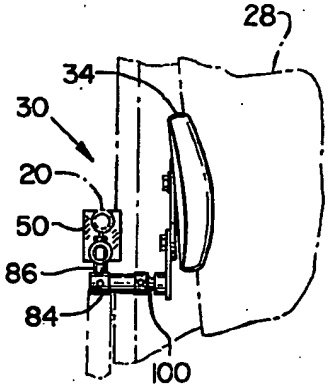


FIG.9

UNIVERSAL SUPPORT PADS FOR WHEELCHAIR

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to a universally adjustable pad for positioning a patient in a chair.

The need for a device to position a patient within a chair, such as in a wheelchair, is becoming increasingly important. Medical and equipment technology now enables more patients to utilize wheelchairs rather than being bedridden.

Increased emphasis recently has been placed on the potential of independent, or self-help, activities of those confined to wheelchairs due to physical or mental impairments or deficiencies. Increased function of the patient's body is essential, and to this end it is often desirable to be able to provide a form of support either of the thigh, hip, or torso to permit the patient to be most comfortable or to function to the greatest degree in an effort and with his own ability to attempt to provide some form of care and movement for himself.

The patient may be handicapped or have a deficiency which prevents him from maintaining full control over his bodily movements due to loss of motor control, lack of muscle tone, slow response to correct inaccurate actuation of muscular activity, congenital or birth defects, or abnormal growth structure. Positioning of such individuals in a seated position to allow them to function most efficiently with their handicap or disability may require limiting or restricting the movement of the thigh, hip or torso, either bilaterally or unilaterally.

A general object of the present invention is to provide a novel device for positioning a patient in a chair which is simply and economically constructed to produce the desired results set out above.

More specifically, an object of the invention is to provide a novel positioning device which is shiftable to selected, adjusted positions to provide positioning control in the areas of the hip, thigh, or torso of the patient and which is mounted on the arm of the chair for selected movement longitudinally of the arm to provide the widest possible range of positioning for the support pad in the device to reach and provide support for all such regions of a patient's body.

A still further object of the present invention is to provide such a novel positioning device which includes a body engaging pad, an attaching clamp for securing the same to the underside of the arm of the chair, and connecting means connecting the pad to the attaching clamp which is operable to provide universal swinging movement of the pad about a plurality of angularly disposed axes, yet which does not structurally protrude to a significant degree beyond the overall limits of the chair, whereby it does not interfere with movement of the patient's arms and self propulsion of the chair through manual operation of the chair wheels.

A further object of the present invention is to provide such a novel positioning device which may be attached to a detachable arm on a wheelchair, secured in a selected position relative to the arm for supporting a patient in a chair, and upon removal of the arm, travels with the arm to permit ease of entrance and exit from the chair without varying adjustment settings on the pad relative to the arm of the chair.

Yet another object of the present invention is to provide such a novel positioning device which permits a wheelchair to be folded as intended by the manufacturer regardless of the location of the device without moving it from its selected adjusted position.

DRAWINGS

These and other objects and advantages will become more fully apparent as the following description is read in conjunction with the drawings wherein:

FIG. 1 is a perspective view of a wheelchair having positioning devices constructed according to an embodiment of the invention mounted thereon and illustrating a patient positioned in the chair, with the patient illustrated in dot-dash-dot line;

FIG. 2 is an enlarged perspective view of a positioning device;

FIG. 3 is an enlarged exploded, perspective view of means for attaching an adjustment member to a patient support pad in the device;

FIGS. 4–7 are side elevation views of a portion of the chair illustrating various adjusted positions to which a support pad of the invention may be adjusted;

FIG. 8 is a cross-sectional view taken generally along the line 8—8 in FIG. 1; illustrating in top plan view a selected adjusted position for the pad; and

FIG. 9 is a view taken along the line 9—9 in FIG. 1 illustrating a front elevational view of the pad in a selected adjusted position.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

Referring to FIG. 1 a wheelchair **10** is illustrated having a pair of laterally spaced, manually operable support wheels **12** and a pair of upstanding, laterally spaced support bars **14** supporting a flexible back **16** for the chair.

A pair of elongate chair arms **20** are supported intermediate wheels **12** and extend forwardly from back support bars **14**. Each arm comprises a tubular member **20*a*** bent in an inverted U-shape and an inverted L-shaped tubular member **20*b*** secured adjacent one of its ends to and projecting forwardly from one leg of member **20*a***. The upper, substantially horizontally disposed crossbar portion of member **20*a*** has an elongate arm pad **24** secured thereto.

The chair frame includes upright support tubes **26** adjacent its forward and rearward corners which telescopically receive a downwardly depending leg of tubular member **20*a*** and the downwardly depending leg of tubular member **20*b***. This permits both chair arms to be removably supported on the chair. As illustrated in FIG. 1, the arms are supported on opposite sides of a flexible seat panel **18**, and each arm may be removed by lifting it out of support tubes **26**. This provides greater access and ease of entry or exit for a patient in the chair.

A patient is illustrated in dot-dash-dot line at **28** in FIG. 1.

A pair of devices according to the invention for positioning a patient in the chair are indicated generally at **30**. Both of devices **30** are similar, and thus only one will be described in detail.

Referring to FIG. 2, a positioning device includes a body engaging pad **34**. The pad is oblong as illustrated, and includes a substantially rigid backing plate **36**. To the inwardly facing side (the side away from the viewer in FIG. 2) of plate **36** is secured a resilient flexible material, such as foam rubber, which is covered by a flexible material, such as vinyl cover **40**.

Referring to FIG. 3, backing plate **36** has a threaded bore **44** formed therein which is positioned more closely

to one edge, or end, of the pad than to the opposite end, or edge. A plurality f depressions, or holes, 46 are arrayed in a circle about bore 44 equadistant from the center of bore 44.

Referring again to FIG. 2, an attachment clamp 50 is provided for attaching the device to the underside of the horizontally disposed cross bar portion of tubular member 20a, illustrated in dot-dash-dot line in FIG. 2. Clamp 50 includes a pair of opposed, mirror image clamp block sections 52, 54. Each block section has a semi-circular groove formed therein, which when the blocks are placed in facing relationship as illustrated, define a semi-circular groove to clamp about tube member 20a beneath arm pad 24. A pair of set screws 56 extend through accommodating bores in clamp box sections 52, 54. The bores in block section 54 are threaded and tightening of the screws secures the clamp member in position on the arm of the chair.

A second pair of semi-circular grooves extend along facing surfaces of blocks 52, 54 to define a rod receiving bore 60 therebetween. This bore extends parallel to the previously mentioned grooves in blocks 52, 54 and thus extends parallel to the arm of the chair when the clamp is attached. A secondary bore 64 extends through blocks 52, 54 perpendicular to bore 60. A threaded bore 66 extends through the underside of block section 52 and into bore 64 to receive a set screw.

An elongate rod 70 is received in bore 60 between block sections 52, 54. A cylindrical member 72 is secured to the end of rod 70 which projects from bore 60. This rod and cylinder combination are referred to herein as a first member. With screws 56 loosened, this first member is shiftable longitudinally of rod 70, and thus longitudinally of the arm of the chair as illustrated by arrow 74. It is also rotatable about the longitudinal axis of rod 70 as illustrated by doubleheaded arrow 76.

Referring still to FIG. 2, cylindrical portion 72 has a bore 78 extending therethrough normal to the longitudinal axis of rod 70 and cylinder 72. A set screw 80 extends inwardly through a threaded bore in the side of cylinder 72.

A second member indicated generally at 84 includes an elongate rod 86 to the lower end of which is secured an elongate, hollow cylindrical element 88. Cylinder 88 is secured adjacent one of its ends to rod 86 and extends substantially normally outwardly from rod 86. With set screw 80 loosened, rod 86 and cylinder 88 are rotatable in either of opposite directions about an axis 90 as illustrated by doubleheaded arrow 92. In the position illustrated, axis 90 extends substantially vertically and intersects the cross bar portion of arm 20a.

Thus, member 84 may be rotated between a first position as illustrated in FIG. 2, in which the major portion of cylinder 88 extends inwardly of the chair in the direction of the face of the arm facing a patient, and a second position directed 180° therefrom with the major portion of cylinder 88 directed outwardly and away from the patient.

As is seen in FIG. 2, a plurality of set screws 96 are received in threaded bores adjacent opposite ends of cylinder 88.

An elongate, tubular shaft 100, also referred to as a third member herein, extends through the central bore of cylinder 88. With set screws 96 loosened, shaft 100 is shiftable l ngitudinally of its central axis relative to cylinder 88, in the directions of doubleheaded arrow 102, and is rotatable about its longitudinal axis in the directions of arrows 104, 106. With set screws 96 tightened, shaft 100 is secured against movement relative to cylinder 88.

Secured to and extending laterally outwardly from one end of shaft 100 is an elongate flat bar 110, also referred to as a fourth member herein. The bar has a bore extending through its end spaced from shaft 100 which receives a bolt 112 therethrough.

An elongate slide member 116 has a threaded bore adjacent one of its ends which receives bolt 112 whereby slide 116 may be secured to bar 110. A plurality of depressions, or holes, 118 are arrayed about the bore receiving bolt 112 and are substantially equadistant therefrom. A dimple, or detent, 120 formed in bar 110 is positioned to project into a hole 18 to secure the slide member 116 against rotation relative to bar 110 when bolt 112 is tightened. When bolt 112 is loosened slide member 116 is swingable about a pivot axis 122 extending longitudinally of bolt 112 in the direction of arrows 123.

Slide member 116 also has an elongate slot 124 formed therein extending longitudinally of the slide member.

A bolt 130 having a washer 132 thereunder extends through slot 124 into threaded bore 44 in backing plate 36 of the pad to secure the pad to slide member 116. Referring to FIG. 3, a holding washer 140 having edge or wing, portions 140a, 140b bent outwardly substantially normal to the central portion of washer 140 is received between slide member 116 and backing plate 36. Wing portions 140a, 140b of washer 140 are spaced apart a distance slightly greater than the width of slide member 116. A dimple, or detent, 142 formed in washer 140 is positioned to be received in one of holes 46. Thus, when bolt 130 is loosened, pad 34 may be swung in opposite directions as illustrated by arrow 144 about axis 146 extending axially of bolt 130. With bolt 130 loosened the pad also is slidable along slot 124 relative to the slide member. When the pad is positioned as desired on the slide member and in an angular position relative to the slide member, tightening of bolt 130 causes washer 132 frictionally to engage slide member 116 to prevent sliding movement of the pad therealong, and detent 142 is received in one of depressions 46 in the backing plate to inhibit rotation of the pad relative to the slide member.

The connector means thus described for operatively connecting patient engaging pad 34 to clamping attachment 50 provides for universal movement of the pad relative to the chair for selected adjustment relative to a patient in the chair. The various degrees of movement of the pad relative to the chair provided by such connector means should be evident from the description of the connections, but such will be described in greater detail below in a description of the operation of the device.

Referring again to FIG. 1, it will be seen that a pair of straps, or belts, 150 are secured at one set of their ends to the pads. The straps may have fastening means, such as velcro strips, adjacent their opposite set of ends to secure them together, as illustrated in FIG. 1, across the body of the patient if it is desired to so secure the patient in the chair.

Describing operation of the device, it should be evident that the support pad is movable to several different positions relative to the arm of the chair, and by being secured to an arm of the chair, is removable therewith. Describing briefly the various degrees of movement of the pad, upon loosening of said screws 56 of the clamp

attachment may be slid longitudinally of the horizontal cross bar portion of the chair arm between positi ns as illustrated in FIGS. 4, 5, 6 and 7. The clamp attachment thus may be shifted forwardly or rearwardly along the arm of the chair, and toward and away from the back of the chair. Rod 70 may be shifted longitudinally relative t the clamp block sections and may be rotated relative thereto.

With set screw 80 loosened, cylinder 88 may be rotated about upright axis 90 as desired. With set screws 96 loosened, shaft 100 is shiftable longitudinally of cylinder 88 and is rotatable therein. With bolt 112 loosened, slide member 116 is rotatable about pivot axis 122 relative to bar 110. With bolt 130 loosened, pad 34 is slidable along slide member 116 and is rotatable about pivot axis 146 relative to the slide member.

It should be mentioned here that cylinder 88 is purposefully secured adjacent one of its ends to rod 86 so that the major portion of cylinder 88 may be swung either toward the inwardly facing side or the outwardly facing side of the chair arm. With the cylinder swung toward the inwardly facing side of the chair arm, maximum lateral extension of shaft 100 inwardly of the chair arm is permitted. With the cylinder 88 swung to a position extended toward the outwardly facing side of the chair arm, shaft 100 and the pad secured thereto may be slid closest to the chair arm. In this way maximum latitude of shifting of the pad laterally of the chair arm is provided without requiring an excess of shaft protruding beyond the outer side of the chair arm which has occurred in previous devices and which would impede arm movement in controlling the chair and other activities.

To provide support for the torso of the body, it is a simple matter to adjust the pad to the position illustrated generally in either FIGS. 1, 2 and 4 whereby the pad extends upwardly from the arm of the chair and can be shifted laterally inwardly against the side of the patient. As is illustrated in FIGS. 8 and 9, which are top and front views respectively of the pad, the various degrees of rotation permitted by the connector devices permit the pad to engage the torso at any desired angle to provide support and comfort to the patient. Lower torso support may be provided by shifting the pad to the position illustrated in FIG. 5. Hip support may be provided by positioning as illustrated in FIG. 6. Positioning as illustrated in FIG. 7 permits support of the thigh portion of the leg of the patient.

After the pad has been positioned as desired, it is a simple matter to tighten the various set screws and bolts therein to secure the various connector members and pad into position whereby the pad will remain locked in that position relative to the arm.

A device as described has many advantageous features. First, by being attached to the underside of the arm as described and by having minimal chance of parts protruding into the way of the arms or hands of the patient, it will provide desired support for the patient without impeding use of the patient's hands or arms. By being shiftable longitudinally along the arm of the chair, maximum range of positioning is obtained for use on either torso, hips, or thighs of the patient. By permitting movement of the clamping device along the arm it permits the pad to be positioned as necessary to provide either frontal support as illustrated in FIG. 8, or side support as illustrated in FIG. 1. The various locking features of the device allow it to be secured in position and remain there throughout use.

While a preferred embodiment of the invention has been described herein, it should be apparent to those skilled in the art that variations and modifications are possible without departing from the spirit f the invention.

What is claimed is:

1. A device f r positioning a patient in a chair having a back and arms, said device comprising

body engaging pad means,

attaching means for attachment to the underside of an arm of the chair and for movement along said arm toward and away from the chair back,

means for securing said attaching means in a selected position on said chair arm,

connecting means operatively connecting said pad to said attaching means accommodating universal movement of the pad relative to said attaching means to place said pad in a selected position relative to said chair for patient positioning, and

securing means for securing said pad in a selected adjusted position.

2. The device of claim 1, wherein said attaching means comprises a clamp slidably mounted on said chair arm and said means for securing said attaching means comprises means for clamping said clamp to said arm to frictionally hold the same against movement along said arm.

3. The device of claim 1, wherein said connecting means comprises a first member mounted on said attaching means for rotation about a substantially horizontal axis extending substantially parallel to and underlying said arm, a second member connected to said first member and underlying said arm for rotation about a substantially upright axis, and a third member underlying said arm and connected to said second member for rotation about a substantially horizontal axis extending transversely of said arm.

4. The device of claim 3, wherein said third member comprises an elongate, substantially horizontally disposed element slidably connected to said second member for selected extension and retraction relative to said second member in a direction extending laterally of said arm.

5. The device of claim 4, which further comprises an elongate fourth member connected adjacent one of its ends to an end portion of said third member and extending outwardly therefrom at a substantial angle relative to the rotational axis for said third member and being swingable about said rotational axis.

6. The device of claim 5, which further comprises an elongate slide member, means pivotally connecting said slide member to said fourth member adjacent a set of ends of said fourth member and said slide member, and means connecting said pad means to said slide member permitting sliding movement of said pad means longitudinally of said slide member and swinging of said pad means relative to said slide member about an axis extending transversely of said slide member.

7. The device of claim 5, wherein said means connecting said pad means to said slide member is spaced more closely to one edge of said pad means than to other edges thereof.

8. The device of claim 7, wherein said securing means comprises detent means operable to produce positive locking of said pad means in a selected position.

9. The device of claim 1, wherein said attaching means comprises a clamp member attachable to the underside of an arm for movement longitudinally

thereof, and said connecting means comprises means connected to said clamp member und rlying said arm and supporting said pad means f r swinging about a first axis which extends substantially horizontally beneath and substantially parallel to said arm, a second axis extending substantially vertically and intercepting said arm, and a third axis extending substantially horizontally beneath said arm and transversely of said arm.

10. The device of claim 9, wherein said connecting means further comprises means mounting said pad means for swinging about a fourth axis which extends substantially horizontally and transversely of said arm and is spaced from said third axis.

11. The device of claim 10, wherein said connecting means further comprises means mounting said pad means for rotation about a fifth axis extending substantially horizontally and transversely of said arm, with said fifth axis being spaced from said third and fourth axes.

12. The device of claim 11, wherein said connecting means further comprises an elongate slide member on which said pad means is slidably mounted accommodating adjustment of the distance between said fourth and fifth pivot axes.

13. The device of claim 12, wherein said fifth axis is spaced from the center of said pad means.

14. A device for positioning a patient in a chair having a back and arms wherein an arm has an inner side facing generally in the direction of a patient and an outer side facing away from the patient receiving region, said device comprising

body engaging pad means,

attaching means f r attachment to the underside of an arm of the chair and f r m vement al ng said arm toward and away from the chair back,

means for securing said attaching means in a selected position n said chair arm,

connecting means operatively connecting said pad to said attaching means accommodating universal movement of the pad relative to said attaching means to place said pad in a selected position relative to said chair for patient positioning, said connecting means comprising a substantially horizontally disposed elongate tubular member pivotally connected adjacent one of its ends to said attaching means, and an elongate shaft mounted removably and slidably in said tubular member for selected longitudinal adjustment relative thereto to permit adjustment of said pad means laterally of said arm, said elongate tubular member being swingable about said upright axis to a first position in which it extends in the direction of the inner side of the arm to permit adjusting said pad means to a position furthest from said arm and a second position extending in the direction of the outer side of the arm to permit adjusting of said pad means to a position nearest to said arm with minimum structure extending beyond said outer side of the arm.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 4,073,537
DATED : February 14, 1978
INVENTOR(S) : Don D. Hammersburg

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In column 4, line 68, delete "of" second occurrence .

Signed and Sealed this

Twenty-sixth Day of *September 1978*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

DONALD W. BANNER
Commissioner of Patents and Trademarks

US006213558B1

(12) **United States Patent**
Axelson et al.

(10) **Patent No.: US 6,213,558 B1**
(45) **Date of Patent: Apr. 10, 2001**

(54) **PELVIC STABILIZATION DEVICE**

(75) Inventors: **Peter W. Axelson**, Bonny Doon; **William M. Richter**, Los Gatos, both of CA (US); **Jamie H. Noon**, Gulshan (BD)

(73) Assignee: **Beneficial Designs**, Miden, NV (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/339,324**

(22) Filed: **Jun. 22, 1999**

(51) **Int. Cl.**[7] **A47C 31/00**
(52) **U.S. Cl.** **297/464**; 297/DIG. 4
(58) **Field of Search** ..... 297/464, 465, 297/487, 488, DIG. 4; 280/250.1, 290; 128/869

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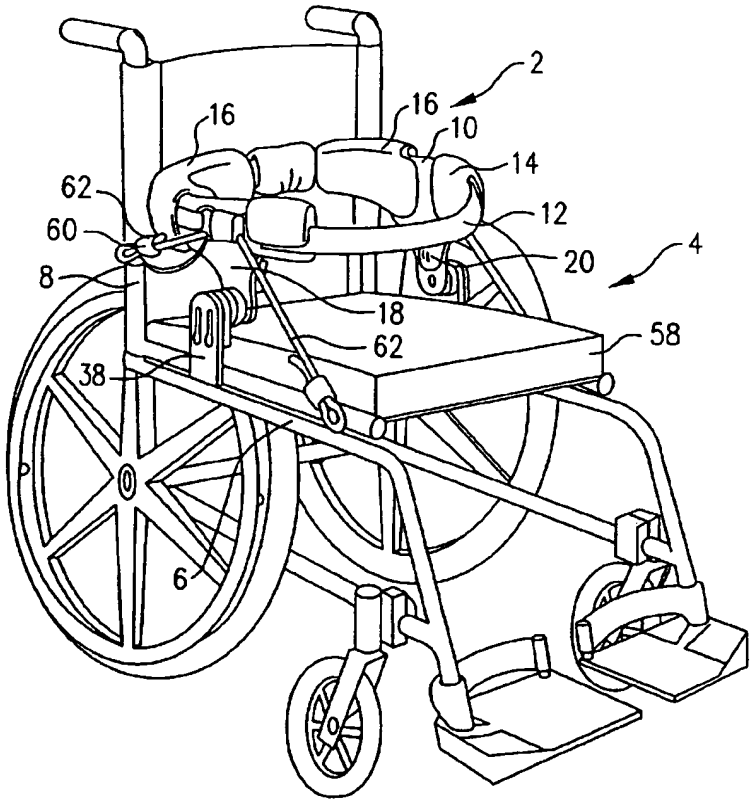
Primary Examiner—Milton Nelson, Jr.
(74) *Attorney, Agent, or Firm*—John M. Johnson; Kaye, Scholer, Fierman, Hays & Handler LLP

(57) **ABSTRACT**

A pelvic stabilization device attachable to a wheelchair includes a pelvic support brace and an apparatus for attaching the pelvic support brace to a wheelchair. A pivot apparatus provides movement of the pelvic support brace with respect to the apparatus for attaching the pelvic support brace, the pelvic support brace being pivotable between a first, neutral position and a second, tilted position. A pivot return apparatus is attached to the pelvic support brace to return the pelvic support brace to the first, neutral position from the second, tilted position. A pivot limiting apparatus limits the amount of pivot of the pelvic support brace that is inducible by the pivot apparatus.

19 Claims, 5 Drawing Sheets



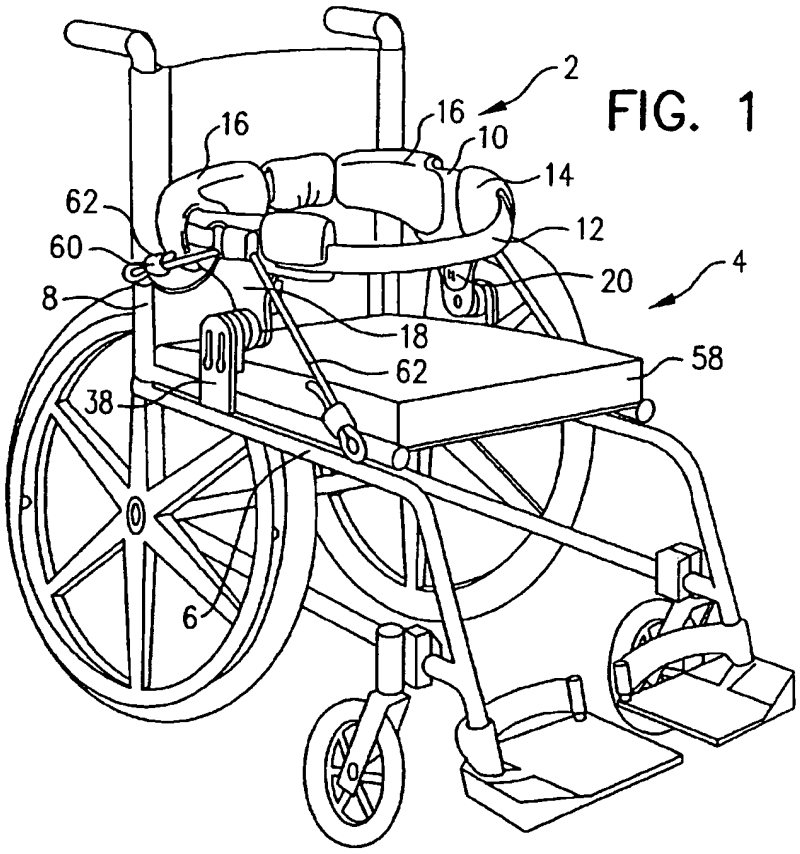

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FIG. 1

FIG. 2

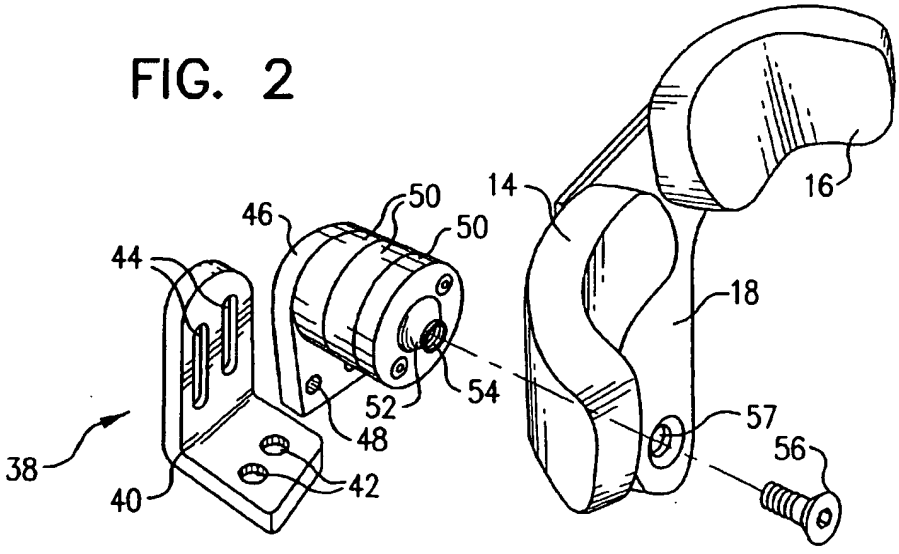
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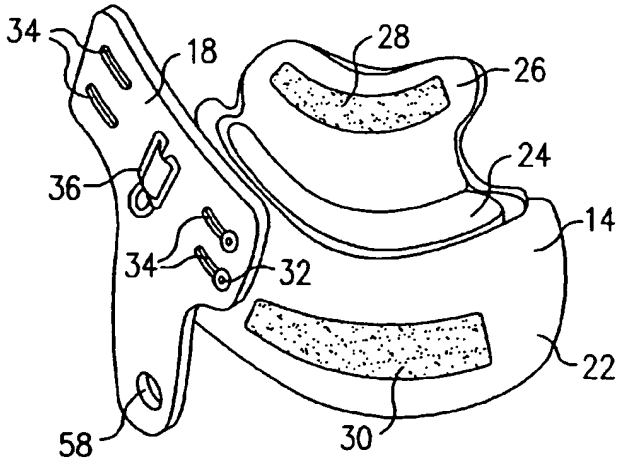
FIG. 3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18
28
26
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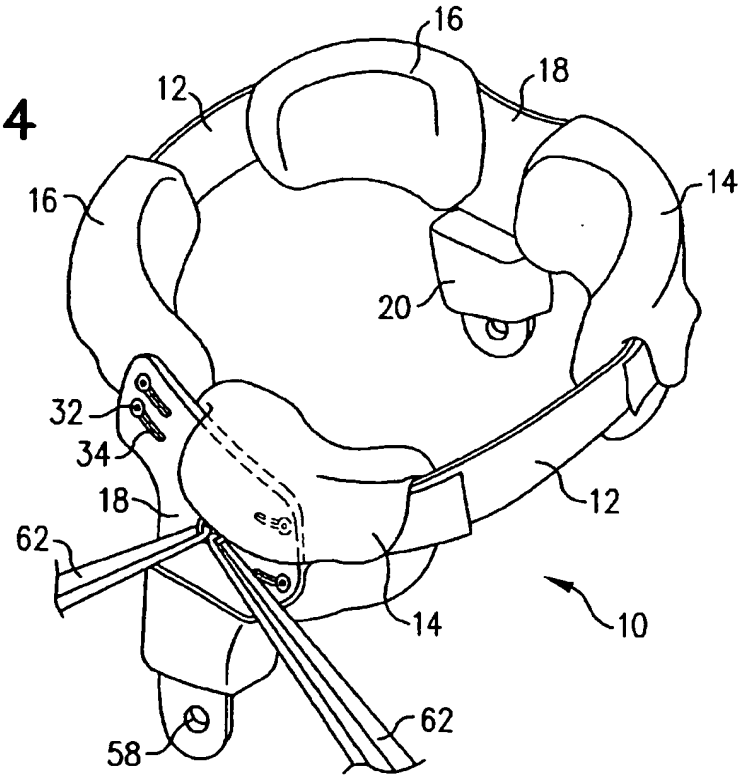
34
32
22
58
30

FIG. 4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34
18
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10
62
58

FIG. 5

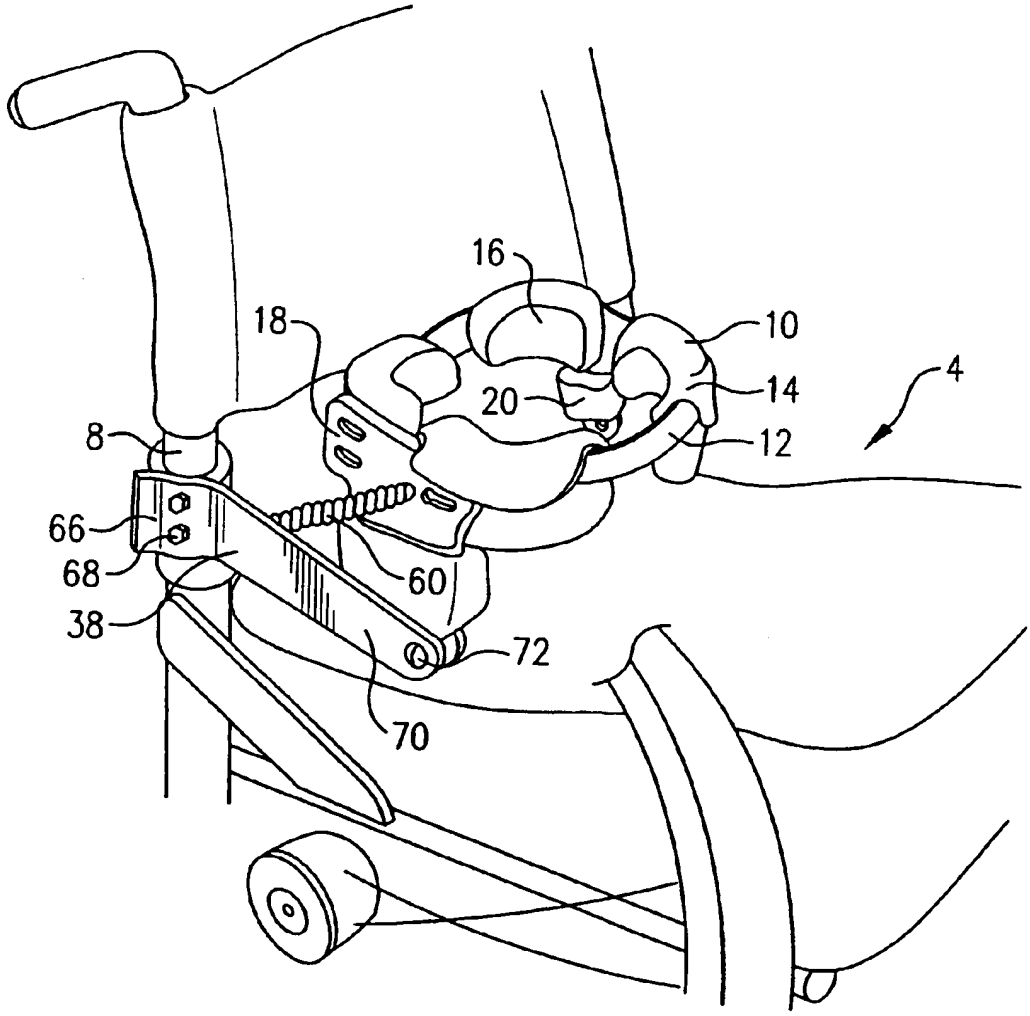


FIG. 6

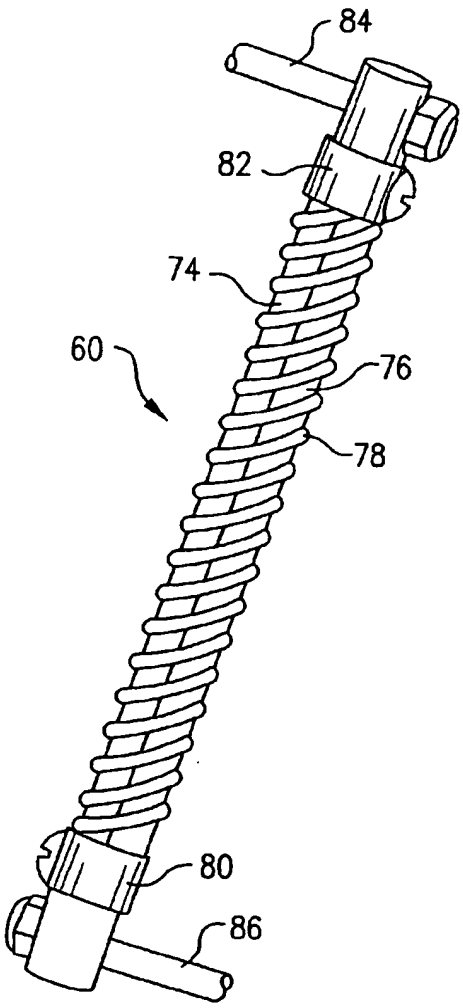


FIG. 7

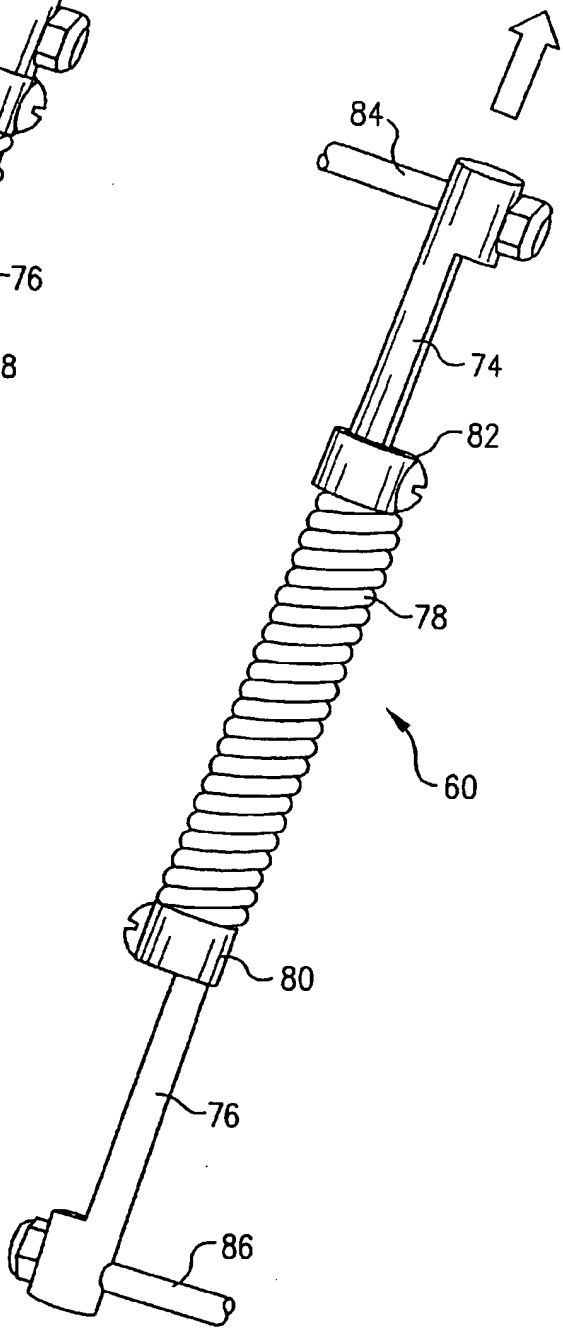
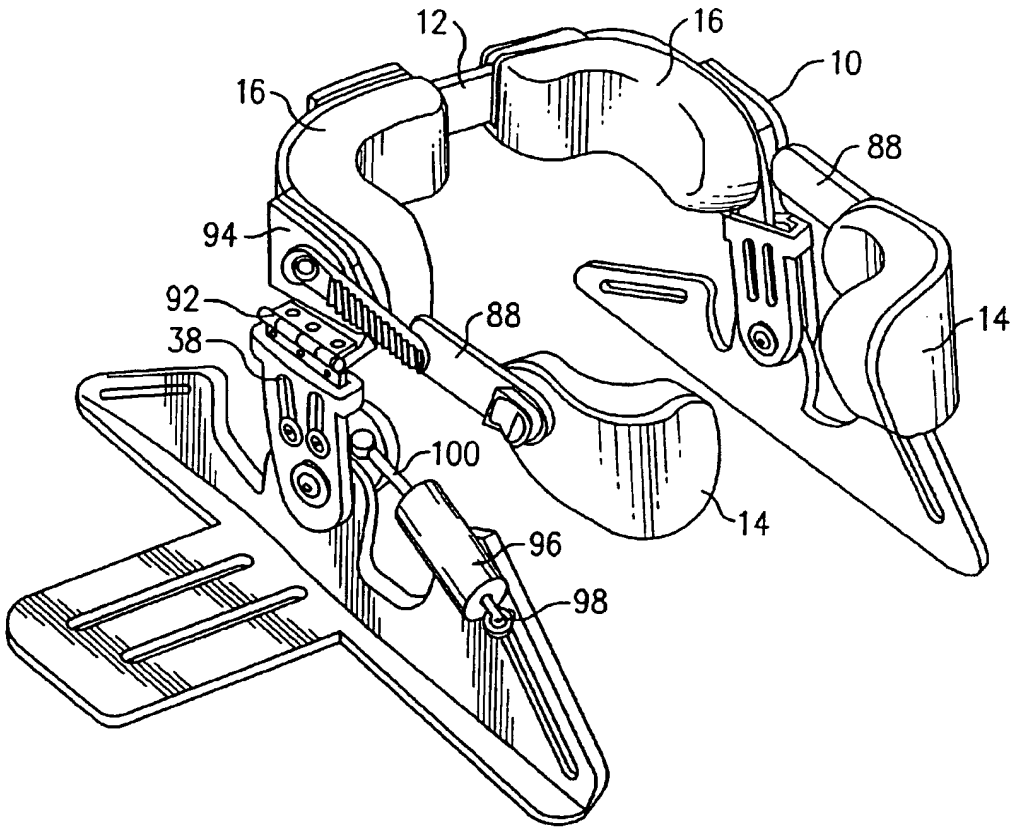


FIG. 8



PELVIC STABILIZATION DEVICE

BACKGROUND OF THE INVENTION

Maintaining a proper pelvic posture and providing stability through the pelvis are critical to overall sitting posture. Freedom of movement can be enhanced by achieving a stable base of support. The optimum position for the pelvis is a slight anterior tilt. An effective pelvic support will prevent the pelvis from tilting posteriorly. A posterior pelvic tilt promotes rounding of the upper spine, which can lead to deformity. For a pelvis which posteriorly tilts, the top of the pelvis must be blocked from moving back and the bottom of the pelvis must be stabilized from moving forward. With adequate proximal support, less support is required distally. Therefore, with increased stability of the pelvis, the user is less dependent upon additional supports in order to maintain a functional, upright sitting posture. Individuals using wheelchairs need assistance to maintain pelvic stability.

The neutral posture of the pelvis is a dynamic state which should be allowed to move. Therefore, a rigidly stabilizing pelvic position is not desirable. Currently available pelvic supports either do not control undesired pelvic movement, or lock the pelvis in a static, non-functional position. The subtle movements of the pelvis are critical to maintaining an active posture and should not be rigidly stabilized.

Currently available pelvic stabilization devices do not move with the user and do not provide a dynamic force to help correct the user's posture after allowing movement. Pelvic support devices which do not maintain contact with the pelvis when the user moves are less effective. Currently available devices do not support the pelvis from the front, back, and sides. A combination of devices, often from various sources, must be used to provide support in these areas. This increases the cost of the seating system, adds bulk and weight, and increases time required to install, fit, and adjust the system for growth. Potential hazards presented by improperly used pelvic include strangulation from sliding out of an ill-fitting system, and tissue damage due to high pressures from rigid anterior pelvic supports.

The following is a summary of currently available pelvic supports, with their deficiencies.

Wheelchair Setup: Orientation-in-Space (OIS): Tilting the wheelchair back uses gravity to hold the pelvis against the backrest. In this position it is difficult for the user to move the pelvis, trunk, and head. The user is left facing upward in a nonfunctional position. Tilting the seat forward activates extension muscles of the trunk and can be used only for short periods (e.g., 15minutes).

Seating Components

Anti-thrust seat (ATS): This type of seat provides a rear section which is lower than the front section. This is designed to hold the pelvis to the rear of the seat. However, the seat height transition can be a source of high pressure, and the pelvis, if not held securely, can move over the transition.

Contoured seat: This type of seat is shaped to conform to the user. It is designed to distribute pressure at the seat surface. The cushion's sloping shape often causes the hips to slide into improper postures. This seat is custom made and cannot be adjusted for growth or change.

Bi-angular back (BAB): This type of backrest provides rear support for the sacrum and upper pelvis. If the front of the pelvis is not supported properly, the BAB can push the user forward in the seat.

Lateral hip pads: These are used at the sides of the hips and are only effective in preventing the pelvis from moving laterally. They do not address lateral tilting of the pelvis.

Anterior pelvic supports

Lap belt: A single attachment lap belt used at a 45 to 90 degree angle to the seat surface is flexible and useful for controlling mild pelvic movement.

Four-point lap belt (translated pivot point): This device can provide more stability than a single attachment lap belt. However, it allows some movement of the pelvis and must be used with a sacral support to provide effective control of pelvic tilt.

Pelvic stabilizer (wide abduction pommel): This device is designed to apply an anterior force to the pelvis at the pubic bone. The pelvic stabilizer can be effective in maintaining the rearward position of the pelvis in the seat. However, if not monitored closely, this device can damage soft tissues.

Sub-ASIS bar: A straight or curved sub-ASIS bar is a rigid, padded bar designed to hold the pelvis just under the ASIS. It tends to be difficult to properly fit and can produce high pressures and tissues damage at the front of the pelvis.

Anterior knee blocks: This device is designed to apply a rearward force at the knee that is transmitted through the femur to the hip joints. This device allows forward tilting of the pelvis, and it relies upon the countering force of a sacral support. Anterior knee blocks and straps can cause further joint problems for users with compromised hip integrity. Some controversy exists about the practice of applying a constant force to the knee and hip joints, particularly in cases where high tone is present.

The following patents all pertain to wheelchairs and support devices therefor.

U.S. Pat. No. 5,678,798 discloses a swing support bracket assembly for mounting support pads to wheelchairs. The assembly includes a housing, an axle mounted for rotation in the housing, and a toggle pivotally mounted in the housing and having a tapered protrusion adapted to engage a cooperating tapered recess in the axle. The support pad may be mounted either directly or by a number of adjustable clamps and support rods to the housing. In another embodiment it is mounted by such rods and clamps to the axle.

U.S. Pat. No. 5,564,788 discloses a support system for maintaining a person in a substantially upright sitting position in a wheelchair, comprising a unitary frame and a unitary cushion. The unitary frame has front and back portions, and a generally rectangularly shaped central portion having upper and lower sections. A pair of upper lateral wing frame portions extend from the upper section of the central portion, and a pair of lower lateral wing frame portions extend from the lower section of the central portion. The unitary cushion is shaped to fit over the frame and comprises a generally rectangularly shaped central cushioned portion having upper and lower sections, a pair of upper lateral cushioned wing portions extending from the upper section of the cushioned central portion and a pair of lower lateral cushioned wing portions extending from the lower section of the cushioned central portion. The pairs of upper lateral wing frame portions and lateral cushioned wing portions, provide bracing to the left and right sides of the person's upper torso in a substantially upright position. The pairs of lower lateral frame wing portions and the upper lateral cushioned wing portions, prevent rotation of the person's pelvis. Each of the upper lateral wing frame and cushioned portions, the central frame and the cushioned sections, and each of the lower lateral frame and cushioned wing portions, are generally C-shaped when viewed from the side.

U.S. Pat. No. 5,447,356 discloses a chair for disabled persons with a supporting frame, a seat adjustably connected

to the supporting frame by a hinge, and a back adjustably connected by a hinge to the rear of the seat. The seat has a front section which lies beneath and supports the upper legs of an occupant, and a rear section which lies beneath and supports the pelvis of an occupant. The front and rear sections can be fixed and adjusted independently of each other due to a hinge which is parallel to the hinge at the rear of the seat.

U.S. Pat. No. 4,813,746 discloses an angular bar mounted on each opposing lower portion of a wheelchair frame for securement of the pelvis of a person seated in the wheelchair. Each bar has a side portion that extends across the lateral region of the hip and a front portion that extends in front of the hips above the thighs. Universal adjustments with a quick release mechanism are provided for independent adjustment of each arm.

U.S. Pat. No. 4,073,537 discloses a device for positioning a patient in a chair having a back and arms. The device includes a pad for placement against the patient and a clamp which underlies an arm of the chair and is shiftable along the length of the arm independently of the back. The pad is connected to the clamp by a series of connecting members which permit universal swinging of the pad about a plurality of angularly disposed and laterally spaced axes. The pad also is mounted for shifting laterally of the attaching clamp and the arm to which it is attached and for shifting vertically and horizontally forwardly and rearwardly relative to the chair. A locking mechanism is provided for securing the pad in any of the infinitely selectable positions for the pad to maintain patient positioning with in the chair. A similar pad attached to the opposing arm on the chair also may be used to aid in patient positioning.

U.S. Pat. No. 3,640,571 discloses a trunk support for use with wheelchairs and the like having contoured trunk support plates disposed laterally of and in supporting contact with the patient's trunk. The plates are secured to the backrest of the chair, are universally moveable for adjustment to the patient's size and shape, and are locked in the supporting position. The plates can be opened to permit the patient to enter or alight from the chair. Stop means are provided so that each time the plates are moved into their trunk supporting position they return to an identical, predetermined position to thereby eliminate the need for adjustments of the plate while used with the same patient.

U.S. Pat. No. 3,704,910 discloses a cushioned torso engaging member adapted to be mounted to one or the other of the handles of a conventional wheelchair or the like either alone or in pairs, by means of an assembly of a handle clamp and linked arms which provide both for angular, elevational and dimensional adjustment of the position of the torso engaging member relative to the wheelchair handle.

SUMMARY OF THE INVENTION

The present invention includes a padded rear shell, two padded front shells, lateral hip pads, a pivot mechanism, a pivot limiter, a fore-aft lock, and attachment hardware. The rear shell supports the pelvis at the sacrum, the posterior superior ilian spines (PSIS's) and the sides of the pelvis. The width of the rear shell will be adjustable to provide a custom fit for each user. The two front shells support the front of the pelvis at and around the anterior superior iliac spines (ASIS's). Lateral hip pads at the greater torchanter are designed to prevent the pelvis from sliding to the sides.

The pivot mechanism allows anterior and posterior tilting of the pelvis. Adjustable centering springs help return the pelvis back to a neutral position and provide dynamic resistance to pelvic movement. The pivot limiter allows pivot movement of the invention, and the user's pelvis, for only a predetermined range of motion. Preferably, a separate adjustment for anterior and posterior tilt ranges allows adjustment of one independently of the other. The pivot limiter can be a mechanism separate from the pivot mechanism or, alternatively, the pivot limitation can be accomplished by the pivot mechanism. The pivot mechanism itself can limit pivot movement when, for example, the pivot mechanism is a spring, elastomeric or piston device. Pivot movement is then limited by the amount of force the user can provide against the pivot mechanism and still attain pivoting movement.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects and features of the invention will become more fully apparent when the following detailed description of the invention is read in conjunction with the accompanying drawings.

FIG. **1** is a perspective view of one embodiment of the pelvic stabilization device of the present invention mounted to the seat frame of a wheelchair and having elastomeric bands as a pivot limiting and return apparatus;

FIG. **2** is a detailed perspective view of the rear pad, front pad, and the pelvic support brace attachment apparatus of FIG. **1**;

FIG. **3** is a detailed perspective view of the front pad and pad mount of FIG. **1**;

FIG. **4** is a detailed perspective view of the pelvic support brace and pivot limiting and return apparatus of FIG. **1**;

FIG. **5** is a perspective view of another embodiment of the pelvic stabilization device of the present invention mounted on the back frame of a wheelchair and having a spring-biased pivot limiting and return apparatus;

FIG. **6** is a detailed perspective view of the spring-biased pivot limiting and return apparatus in the non-extended orientation;

FIG. **7** is a detailed perspective view of the spring-biased pivot limiting and return apparatus in the extended orientation; and

FIG. **8** is a perspective view of yet another embodiment of the pelvic stabilization device of the present invention having a gas piston-based pivot limiting and return apparatus.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. **1** through **4**, a first embodiment of the pelvic stabilization device **(2)** of the present invention is shown. Pelvic stabilization device **(2)** is removably mountable onto wheelchair **(4)**; wheelchair **(4)** including a seat frame **(6)** and a back frame **(8)**. Pelvic stabilization device **(2)** includes pelvic support brace **(10)**, which may be comprised of a substantially circular pad securing strap **(12)** with front pads **(14)** and rear pads **(16)** radially therearound. It is to be understood that strap **(12)** can be made of flexible natural or polymeric material, or alternatively can be comprised of a rigid material as are side supports **(88)** and rear support **(90)** of the embodiment of FIG. **5**. As best shown in FIGS. **2** and **3**, front pads **(14)** and rear pads **(16)** are attached to pad mount **(18)**; one pad mount **(18)** being located on each side of pelvic support brace **(10)**. As shown in FIG. **1**, hip pads **(20)** are also located on pad mount **(18)**, below front pads **(14)** and rear pads **(16)**. As shown in FIGS. **1** through **5**, front pads **(14)** and rear pads **(16)** preferably have a pad

exterior shell (22) comprised of a thermo-formed plastic, into which is placed a foam insert (24). As best shown in FIG. 3, front pads (14) and rear pads (16) include a flap (26) that can be opened to provide access into the interior of pad exterior shell (22) for the placement of foam insert (24) therein. Flap (26) is releasably secured to pad exterior shell (22) by mating book and loop fasteners (28) and (30) on flap (26) and pad exterior shell (22), respectively. Front pads (14) and rear pads (16) are preferably contoured to comfortable mate with the exterior curves of the lower torso, i.e., hips, of the user. Still referring to FIG. 3, front pads (14) and rear pads (16) are removably attached to pad mount (18) by screws (32) which pass through fore/aft horizontal adjustment slots (34) of pad mount (18) and into either front pad (14) or rear pad (16). Note that the longitudinal orientation of fore/aft horizontal adjustment slots (34) of pad mount (18) allow front pads (14) and rear pads (16) to be placed longitudinally at a plurality of locations on pad mount (18) in order to accommodate the physical dimensions of different users. To further secure front pads (14) and rear pads (16) on pad mount (18), pad securing strap (12) passes through pad securing strap anchor (36), a buckle-like opening in pad mount (18).

Referring to FIGS. 1 and 2, pelvic support brace attachment apparatus (38) includes chair mounting bracket (40) that is attachable to seat frame (6) of wheelchair (4) by bolts placeable through bolt holes (42) of chair mounting bracket (40). Two chair mounting brackets (40) are present, one on each side of wheelchair (4). For users with pelvic rotation to vary the orientation of the pelvic support brace (10) with respect to the depth dimension of wheelchair seat (58), one of the two chair mounting brackets (40) can be located farther fore or aft along seat frame (6) than is the other chair mounting bracket (40). Chair mounting bracket (40) is a substantially L-shaped member in cross-section, having longitudinal slots (44) in the upper portion thereof, and bolt holes (42) in the lower portion thereof. Disk mounting bracket (46) is attachable to chair mounting bracket (40) by orientation of bolt holes (48) of disk mounting bracket (46) with longitudinal slots (44) located in the upper portion of chair mounting bracket (40), with subsequent placement of bolts through bolt holes (48) and through longitudinal slots (44). Note that disk mounting bracket (46) can be oriented at a plurality of heights along chair mounting bracket (40) due to the longitudinal orientation of slots (44); in this manner, the height of pelvic support brace (10) can be varied with respect to wheelchair (4) in order to accommodate the physical dimensions of different users. Furthermore, one disk mounting bracket (46) can be mounted higher or lower on its chair mounting bracket (40) than the other disk mounting bracket (46) is mounted on its chair mounting bracket (40) to vary the orientation of the pelvic support brace (10) with respect to the height dimension of wheelchair seat (58) in order to accommodate users with pelvic obliquity. Disk mounting bracket (46) has a plurality of spacer disks (50). Each spacer disk (50) is toroidal in shape, and the spacer disks (50) function to provide distance between seat frame (6) of wheelchair (4) and pelvic support brace (10), such that a narrower pelvic support brace (10) be employed by a user with smaller hips requires more spacer disks (15) between pelvic support brace (10) and pelvic support brace attachment apparatus (38) to secure pelvic support brace (10) to pelvic support brace attachment apparatus (38). To vary the location of pelvic support brace (10) along the width dimension of wheelchair seat (58), more or less disk spacers (15) can be placed on one pelvic support attachment apparatus (38) than are on the other pelvic support attachment apparatus (38). Ball joint (52) is centrally located in the spacer disk (50) adjacent pad mount (18). Ball joint (52) is rotatable with respect to spacer disks (50) and has threaded opening (54) centrally located therein. Pad mount (18) is attached to ball joint (52) by placement of pad mount attachment bolt (56) through pad mount hole (57) of pad mount (18) and into threaded opening (54) of ball joint (52). In this manner, pad mount (18) and pelvic support brace (10) is pivotable with ball joint (52) with respect to pelvic support brace attachment apparatus (38) and wheelchair (4) such that the horizontal plane of pelvic support brace (10) can pivot from being parallel to the horizontal plane of wheelchair seat (58) to being aparallel to the horizontal plane of wheelchair seat (58). The pivoting movement of pelvic support brace (10) can occur in two directions; in one direction rear pads (16) pivoting downward toward wheelchair seat (58) and front pads (14) moving upward away from wheelchair seat (58), and in the other direction rear pads (14) moving upward away from wheelchair seat (58) and front pads (14) moving downward toward wheelchair seat (58). The degree of fore or aft pivot of pelvic support brace (10) with respect to wheelchair (4) can be limited to a predetermined number of degrees by placement of a stop device adjacent ball joint (52) that blocks rotational movement of ball joint (52) after a predetermined amount of rotational movement has occurred. Note that ball joint (52) has three degrees of freedom with respect to the stationary elements of pelvic support brace attachment apparatus: rotational movement, fore and aft movement and up and down movement. These three degrees of freedom allow for the fore and aft pivoting of pelvic support brace (10) when the two chair mounting brackets (40) are asymmetrically oriented and/or the two disk mounting brackets are asymmetrically oriented to accommodate a user with pelvic obliquity and/or pelvic rotation.

Now referring to FIGS. 1 and 4, pivot limiting and return apparatus (60) is comprised of elastomeric band (62) and elastomeric band (64). Elastomeric bands (62) and (64) are attached to pad mount (18) at one end, and seat frame (6) of wheelchair (4) at the other end. Elastomeric bands (62) and (64) maintain pelvic support brace (10) in a neutral position such that the horizontal plane of pelvic support brace (10) is substantially parallel to the horizontal plane of wheelchair seat (58). If a slight offset from the horizontal plane of wheelchair (58) is desired, in the neutral position the elastomeric force of one of elastomeric bands (62) or (64) can be made greater than the elastomeric force of the other of elastomeric bands (62) or (64). Elastomeric bands (62) and (64) also limit the pivot movement of pelvic support brace (10) with respect to wheelchair (4) in both the fore and aft directions, based upon the amount of elasticity of elastomeric bands (62) and (64) in conjunction with the weight and strength of the user. In other words, after elastomeric band (62) or (64) has been stretched a predetermined amount upon pivoting of pelvic support brace (10), the user will not be able to pivot pelvic support brace (10) any further due to resistance encountered by the stretched elastomeric band (62) or (64). Elastomeric bands (62) and (64) also function to return pelvic support brace (10) to the neutral position described above after the user has ceased providing force against elastomeric band (62) or elastomeric band (64) and the user adopts a relaxed posture due to the characteristic of elastomeric band (62) and elastomeric band (64) to return to their non-extended configuration.

Referring to FIGS. 5 through 7, a second embodiment of the present invention is shown in which elements identical to the elements disclosed in FIGS. 1 through 4 of the first

embodiment of the present invention have like element numbers. In the second embodiment of the present invention, pelvic support brace attachment apparatus is attachable to back frame (8) of wheelchair (4) as opposed to seat frame (6) thereof Pelvic support brace attachment apparatus includes a split collar (66) placeable over back frame (8). Subsequent to placing split collar (66) over back frame (8), collar bolts (68) are tightened to secure pelvic support brace attachment apparatus (38) to wheelchair (4). The height at which pelvic support brace (10) is placed on wheelchair (4) can be altered based on the location of pelvic support brace attachment apparatus (38) longitudinally on back frame (8). Pelvic support brace apparatus (38) also includes arm (70) with split collar (66) at one end thereof and disk mounting bracket bolt opening (72) at the other end thereof. As in the first embodiment of the present invention, as shown in FIG. 2, disk mounting bracket (46) is employed, and is secured to arm (70) of pelvic support brace attachment apparatus (38) of FIG. 5 by placement of a bolt through disk mounting bracket bolt opening (72) and into disk mounting bracket (46). Again, as shown in FIG. 2, spacer disks (50) and ball joint (52) having threaded opening (54) are also present and pad mount (18) is attached to disk mounting bracket (46) by placement of pad mount attachment bolt (56) through pad mount bolt (58) and into threaded opening (54) of ball joint (52). Still referring to FIG. 5, the second embodiment of the present invention has a pivot limiting and return apparatus (60). Pivot limiting and return apparatus (60) in FIG. 5, however, is not comprised of elastomeric bands but, instead, consists of a spring biased device that is substantially parallel with the longitudinal axis of arm (70) of pelvic support brace attachment apparatus (38). As shown in FIGS. 6 and 7, pivot limiting and return apparatus (60) includes a first rod (74) and a second rod (76) that are substantially parallel. Both first rod (74) and second rod (76) are located within spring (78). Spring (78) is fixedly attached at one end thereof to first rod collar (80) and at the other end thereof to second rod collar (82). First rod collar (80) is also secured to one end of first rod (74). Second rod collar (82) is secured to the end of second rod (76) most distantly located from the end of first rod (74) that is fixedly attached to first rod collar (80). The end of first rod (74) not attached to first rod collar (80) has pelvic support brace bolt (84) passing perpendicularly therethrough to attach pivot limiting and return apparatus (60) to pad mount (18) of pelvic stabilization device (2). Likewise, the end of second rod (76) not attached to second rod collar (82) has wheelchair bolt (86) passing perpendicularly therethrough to attach pivot limiting and return apparatus (60) to arm (70) of pelvic support brace attachment apparatus (38). In operation, pelvic support brace (10) is maintained in the desired neutral position, as shown in FIG. 6, when spring (78) is oriented in a non-biased configuration between first rod collar (80) and second rod collar (82). When the user of wheelchair (4) pivots forward to cause pivoting of pelvic support brace (10), as shown in FIG. 7, spring (70) is compressed between first rod collar (80) and second rod collar (82) as first rod (74) and second rod (76) move parallel with respect to each other, but in opposite directions. The amount of movement of first rod (74) and second rod (76), and thus the amount of movement of pelvic support brace (10) with respect to wheelchair (4), is a function of the degree to which spring (78) can be compressed, which is, in turn, a function of the spring force of spring (78) and the size and weight of the user of wheelchair (4). When the user of wheelchair (4) adopts a relaxed posture, spring (78) will again expand, as shown in FIG. 6, to return pelvic support brace to the neutral position with respect to wheelchair (4).

Now referring to a third embodiment of the present invention, elements described herein that are the same as elements previously described in the first and second embodiments of the present invention use like element numbers. Pelvic support brace (10) of FIG. 8 is of a more rigid construction than pelvic support brace (10) of the first and second embodiments of the present invention as shown in FIGS. 1 through 7. Thus, pelvic support brace (10) of FIG. 8 lacks pad securing strap (12) at the front portion of pelvic support brace (10). Furthermore, side supports (88), comprised of a rigid plastic, are employed for lateral movement of front pads (14) to adjust the length of pelvic support brace (10). Rear support (90), comprised of a rigid plastic, also moves laterally to adjust the width of pelvic support brace (10) by moving rear pads (16) closer together or farther apart. As in the first embodiment of FIGS. 1–4, the two pelvic support brace attachment apparatuses (38), one of which is preferably located on each side of pelvic support brace (10), can each be moved vertically independently of one another, i.e., one pelvic support brace attachment apparatus (38) can be oriented higher or lower than the other, to accommodate users with pelvic obliquity. Hinge (92) is located between pelvic support brace bracket (94), which is attached to rear support (16), and pelvic support brace attachment apparatus (38). Hinge (92) allows fore and aft pivoting of pelvic support brackets, as discussed further below, without binding when the two pelvic support brace apparatuses (38) are oriented at different heights to accommodate the pelvic obliquity of the user.

In the third embodiment of the present invention, pivot limiting and return apparatus (64) includes gas charged piston (96) having a first end (98) attachable to seat frame (6) of wheelchair (4), and a second end having shaft (100) reciprocatable therein, and attachable to pelvic support brace bracket (94). Pelvic support brace bracket (94) pivots with pelvic support brace (10) with respect to wheelchair (4). As shown in FIG. 8, when pelvic support brace (10) is in the neutral position, shaft (100) of gas charged piston (96) is extended based upon the pressurized gas in gas charged piston (96). When the user of pelvic support brace (10) pivots forward, shaft (100) retracts into gas charged piston (96) an amount equivalent to the force applied by the user, thus limiting the pivot movement of pelvic support brace (10). When the user adopts a relaxed posture after pivoting, the gas in gas charged piston (96) expands, thereby extending shaft (100) outwardly from gas charged piston (96) to return pelvic support brace (10) to its neutral position with respect to wheelchair (4). It is readily apparent that a second gas charged piston (96) can be attached to pelvic support brace (10) and wheelchair (4) in an opposite orientation from the orientation of gas charged piston (96) shown in FIG. 8 in order to limit aft pivoting of pelvic support brace (10) with respect to wheelchair (4) and to return pelvic support brace (10) to its neutral position with respect to wheelchair (4) after aft pivoting has occurred. Gas charged pistons (96) of differing resistance can be employed for users of different weight.

EXAMPLE

Clinical evaluations were conducted to obtain objective measurements and subjective feedback from users and caregivers to assess fit and performance and to identify areas needing improvement. All evaluations were conducted at the Rehabilitation Technology and Therapy Center of Lucille Packard Children's Health Services at Stanford (RTTC) in Palo Alto, Calif.

Development of Seating Simulator. A seating simulator was developed for use during the Phase I clinical evalua-

tions. It was used to simulate the components currently used in each participant's seating system and to mount the pelvic stability device. Comparing the subject's current seating in his/her own wheelchair to sitting in a simulator with the pelvic stabilization device would not be an accurate comparison. Therefore, a facsimile of each subject's current seating system was set up in the simulator to compare with the pelvic stability device in the simulator. The simulator consisted of a PinDot casing frame mounted to a wheelbase with added tracks along the seat and backrest to which various seating components could be mounted. The locations of the subject's existing components were recorded. Seating components that were available to simulate the subject's existing seating included various sized and shaped sub-ASIS bars, several seat belts, various shoulder straps and harnesses, lateral trunk supports, lateral hip pads, an anti-thrust seat, a bi-angular back, an abductor, and thigh adductors.

Subject Selection. Potential participants were recruited through the Stanford RTTC, Parents Helping Parents, and United Cerebal Palsy. All potential subjects were screened by telephone by the project clinician. Those excluded from participation included persons with severe orthopedic deformities, abnormal tone or movement disorders, or a delicate medical condition (e.g., arthrogryposis, spinal muscular atrophy, osteogenesis imperfecta, sores or bruises in the pelvic area, hip joint pain when sitting, fragile bones, respiratory illness that is affected by sitting upright, general weakness). Subjects selected for participation used a wheelchair as their primary means of mobility, had a history of problems controlling pelvic posture in their wheelchair, and were capable of demonstrating some form of communication ("yes" and "no" either directly or through an interpreter).

A total of 20 wheelchair users participated in the study. All study participants had cerebral palsy, although this was not a requirement. The subject group consisted of 15 (75%) males and 5 (25%) females, ranging from 8.7 to 50.6 years of age, with an average age of 23.3 years.

Clinical Assessment The clinical assessments were conducted by the project clinician and a Stanford RTTC physical or occupational therapist. After informed consent was obtained, the clinical assessments were conducted as follows:

1. Background information was obtained including diagnosis/disability, relevant orthopedic problems, areas of pain or discomfort, method of communication (participant and caregiver were asked to demonstrate communication of "yes", "no," "pain", and other appropriate words or concepts), skin condition, history with regard to pressure ulcers, bruises or areas of risk, and level of sensation.

2. Range of motion and flexibility of pelvis, trunk, hip and knee joints, and hamstring tightness were measured with subject in supine position.

3. Postural tendencies in sitting were observed and recorded. Muscle tone was characterized as athetoid, ataxic, or spastic, and high, low, and/or mixed.

4. Level of support needed for good stability was recorded as hands free, uses hands, requires support at pelvis, or requires support higher than pelvis.

5. Measurements of the pelvis were taken with the subject supported in sitting at the edge of a firm mat in an upright and neutral posture. Pelvic measurements included: width of pelvis (from left and right iliac crest), greater trochanter distance between left and right PSIS, width of hips at greater trochanter, height of PSIS at seat surface, height of iliac crest from seat surface, distance between left and right ASIS, depth of pelvis (from ASIS to PSIS), a seat surface to top of proximal thigh, height of ASIS from seat surface, and circumference at top of pelvis. A flexible ruler was used to trace a cross section of the pelvis at the waistline, front and back.

Wheelchair and Seating System Specifications. The following wheelchair and seating system specifications were recorded: wheelchair manufacturer and model, manual or powered wheelchair, tubing diameter, width, height, depth, age of wheelchair, age of seating system, date of last adjustment/modification. The types of seating components used in the current seating system were recorded in the following categories: seat, pelvic support, backrest, headrest, leg support, foot support and arm support. Detailed measurements and angles of support surfaces were also recorded.

Setup and Fitting of Seating Simulator with Current Components. A multi-adjustable seating simulator was configured to simulate the subject's existing seating system. Feedback from the subject and/or caregiver was recorded and used to ensure a comfortable fit. Small, rectangular, custom-designed FSA (Force Sensing Array) pressure measurement mats were placed between the subject and any support surface at the front and rear of the pelvis. Pressure readings were taken and examined to ensure proper fit of the pelvic support components. If high pressure readings were observed, the subject was asked to comment on any discomfort and the project clinician palpated the area in question. The simulator was adjusted and the subject was repositioned until the high pressure areas were eliminated.

Antorpometric Measurements. with the subject seated on a firm mat, measurements were taken to determine the appropriate size pelvic stability device shell to be tested and to optimize the size ranges of the other components of the invention. Using a flexible ruler, the front (around the ASIS's) and back (around the PSIS's) of the pelvis was traced.

Postural Measurements in Simulator with Current Components. Postural measurements were made with the subject seated in the simulator that was set up to mimic the subject's current wheelchair seating system. Anterior/posterior pelvic tilt was measured in degrees with the PALM (PALpation Meter) positioned at the ASIS and PSIS, or in centimeters by measuring the distance from the ASIS to the lateral condyle of the knee. Pelvic obliquity was measured in degrees using the PALM positioned at the left and right iliac crests. The height of the top of the head was measured from a fixed reference point along the backrest. Forward pelvic movement was measured from the lateral condyle of the femur to a fixed reference point at the front of the seat. Trunk angle was measured using a modified inclinometer with adjustable arms positioned between the sternal notch and the xyphoid process.

Functional Tests in Simulator with Current Components. Each subject was used as his/her own control. Functional performance with use of the invention was compared to the simulated current seating system. Simple, objective tests were developed to assess the subject's functional abilities in the simulated current seating system and the invention. The tests were selected or designed to fit the functional abilities of the individual. These tests included: (1) part-time activation of a hand switch with auditory feedback; (2) reaching distance to a hand switch or pre-determined object; (3) timed knocking down a series of dominoes set at a fixed distance from the participant; (4) timed reaching and touching pre-

determined objects; (5) timed domino placement; (6) number of successful attempts to grab a pen at a fixed distance from the participant; (7) number of balls thrown into a bucket at a fixed distance; (8) timed handwriting a predetermined sentence or phrase; (9) timed typing of a predetermined sentence; (10) four-point laser race with laser attached to headband; (11) head switch activation count within pre-determined period of time; and (12) timed activation of a foot switch. Three trials of the selected activity were performed and scores recorded for each. Pressure readings were taken with the FSA (Force Sensing Array) Pressure Measurement System (Vista Medical) during the functional activity and again after the functional activity to identify any high pressure areas that occurred during the activity.

Postural Measurement in Simulator with Current Components. Postural measurements were repeated after the functional test was performed in order to record any changes in posture due to the activity.

Fitting and Adjustment of the Invention. The subject was then transferred to the mat in order to allow for installation of the invention into the simulator and to check for redness of the skin at the ASIS, PSIS, sacrum, and ischial tuberosities. Seating components (such as lower backrest, lateral hip pads, sub-ASIS bar, and lap belt) that were used in the simulator were removed. The appropriate size invention (small or large) was selected, mounted into the simulator, and adjusted based on the subject's pelvic measurements. The subject was then transferred into the simulator with the invention and minor adjustments were made. The amount of dynamic resistance was selected based on the subject's tone and range of motion. The range of anterior/posterior pelvic tilt allowed by the invention was adjusted based on flexibility, balance, and feedback from the subject. Pad shapes and settings were modified and adjusted based on feedback, pressure reading, and palpation of the pelvis. Feedback on comfort was obtained from the participant. The evaluation did not continue until the participant conveyed that he/she was comfortable.

Postural Measurements in Simulator with the Invention. After the invention was adjusted to properly fit the participant, postural measurements were taken.

Functional Test in Simulator with the Invention. The same functional test(s) was then repeated with use of the invention. Pressure readings were taken with the FSA during the functional activity and again after the functional activity to identify any high pressure areas that occurred during the activity.

Postural Measurements in Simulator with the Invention. Postural measurements were repeated after the functional test was performed in order to record any changes in posture due to the activity.

Subjective Feedback. Feedback was obtained through an interview process. The participant, parent or caregiver, and therapist and/or clinician were asked questions regarding level of comfort, perceived stability, aesthetics, differences between the invention and the original seating system, pros and cons of the invention, priorities regarding pelvic support, ease of use, possible benefit for this particular participant, durability, impact on function, integration into the normal activities of the user, and design improvement suggestions.

Results of Clinical Evaluation. The clinical evaluations revealed much about pelvic movements in persons with cerebral palsy and how these movements need to be controlled. The need for a pelvic stabilization device that offers versatility, permits movement, provides stability and enhances function in persons with cerebral palsy was clearly demonstrated.

All 20 study participants relied on specialized seating in their wheelchairs and had difficulties achieving and maintaining good sitting posture. The invention was shown to decrease unwanted pelvic movement and increase function by providing a stable base of support. The postural measurements taken during the evaluations indicated that the invention controlled pelvic posture in 80% of the subjects tested. Half (50%) of the subjects who were evaluated indicated that it was more comfortable than their current seating system.

The average user needed less support in front of the pelvis that those with strong extensor tone. Although the range of anterior/posterior pelvic tilt permitted with the invention was small, this dynamic component of the system provide to be extremely beneficial to some users. Dynamic stabilization provided by the invention allowed pelvic movement to occur, and then gently assisted the pelvis in moving back into the desired position. The dynamic component of the invention led to improved motor function in approximately 70% of the subjects tested. The dynamic stabilization achieved with the invention also resulted in a decrease in muscle tone exhibited by the user. The user evaluation demonstrated the benefits of dynamic pelvic positioning for persons with cerebral palsy over devices that provide static positioning.

What is claimed is:

1. A pelvic stabilization device attachable to a wheelchair and adapted to a portion of a torso of a user, said pelvic stabilization device comprising:

a pelvic support brace;

means for attaching said pelvic support brace to a wheelchair;

pivot means for pivoting movement of said pelvic support brace with respect to said means for attaching said pelvic support brace based upon force from the torso of the user, said pelvic support brace pivotable between a first, neutral position and a second, tilted position based upon force from the torso of the user; and

pivot limiting and return means attached to said pelvic support brace to limit the amount of pivot of said pelvic support brace that is inducible by said pivot means and to return said pelvic support brace to said first, neutral position from said second tilted position.

2. The pelvic stabilization device of claim **1** wherein said pelvic support brace is comprised of two rear portions, two front portions, and two lateral hip portions.

3. The pelvic stabilization device of claim **1** wherein said pivot limiting and return means is attached to said means for attaching said pelvic support brace to a wheelchair.

4. The pelvic stabilization device of claim **1** wherein said pivot limiting and return means is a spring.

5. The pelvic stabilization device of claim **1** wherein said pivot limiting and return means is an elastomeric band.

6. The pelvic stabilization device of claim **1** wherein said pivot limiting and return means is a gas-containing piston.

7. The pelvic stabilization device of claim **1**, further comprising a hinge between said pelvic support brace and said means for attaching said pelvic support brace to a wheelchair, said hinge allowing movement of said pelvic support brace to accommodate variable orientation of said pelvic support brace on said wheelchair.

8. The pelvic stabilization device of claim **1**, further comprising means for adjusting a vertical distance of said pelvic support brace from a wheelchair.

9. The pelvic stabilization device of claim 1 wherein said pivot limiting and return means has a resistance to force applied by a user against said pelvic support brace, said resistance to force of said pivot limiting and return means being variable.

10. The pelvic stabilization device of claim 1 wherein said pivot means pivots movement of said pelvic support brace between said first, neutral position and said second, tilted position, and between said first neutral position, and a third, tilted position, said third position being in an opposite direction than said second, tilted position.

11. A pelvic stabilization device attachable to a wheelchair, the wheelchair having a seat portion having a width dimension, a depth dimension, and a height dimension, said pelvic stabilization device comprising:

a pelvic support brace having a fore portion and an aft portion;

means for attaching said pelvic support brace to a wheelchair;

pivot means for pivoting movement of said pelvic support brace with respect to said means for attaching said pelvic support brace, said pelvic support brace pivotable between a first, neutral position and a second tilted position;

pivot limiting and return means attached to said pelvic support brace to limit the amount of pivot of said pelvic support brace that is inducible by said pivot means and to return said pelvic support brace to said first, neutral position from said second, tilted position,

first means and second means for adjusting the pelvic support brace laterally across the width dimension of the seat portion of the wheelchair, the first means and second means for adjusting the pelvic support brace laterally being independently adjustable from one another across the width dimension of the seat portion of the wheelchair;

first means and second means for adjusting the pelvic support brace horizontally along the depth dimension of the seat portion of the wheelchair, the first means and second means for adjusting the pelvic support brace horizontally being independently adjustable from one another along the depth dimension of the seat portion of the wheelchair; and

first means and second means for adjusting the pelvic support brace vertically above the height dimension of the wheelchair, the first means and second means for adjusting the pelvic support brace vertically being independently adjustable from one another above the height dimension of the seat portion of the wheelchair.

12. The pelvic stabilization device of claim 11 wherein said pelvic support brace is comprised of two rear portions, two front portions and two lateral hip portions.

13. The pelvic stabilization device of claim 11 wherein said pivot limiting and return means is attached to said means for attaching said pelvic support brace to a wheelchair.

14. The pelvic stabilization device of claim 11 wherein said pivot limiting and return means is a spring.

15. The pelvic stabilization device of claim 11 wherein said pivot limiting and return means is an elastomeric band.

16. The pelvic stabilization device of claim 11 wherein said pivot limiting and return means is a gas-containing piston.

17. The pelvic stabilization device of claim 11 further comprising a hinge between said pelvic support brace and said means for attaching said pelvic support brace to a wheelchair, said hinge allowing movement of said pelvic support brace to accommodate variable orientation of said pelvic support brace on said wheelchair.

18. The pelvic stabilization device of claim 11 further comprising means for adjusting a vertical distance of said pelvic support brace from a wheelchair.

19. A pelvic stabilization device attachable to a wheelchair, the wheelchair having a seat portion having a width dimension, a depth dimension, and a height dimension, said pelvic stability device comprising:

a pelvic support brace;

means for attaching the pelvic support brace to a wheelchair;

first means and second means for adjusting the pelvic support brace laterally across the width dimension of the seat portion of the wheelchair, the first means and second means for adjusting the pelvic support brace laterally being independently adjustable from one another across the width dimension of the seat portion of the wheelchair;

first means and second means for adjusting the pelvic support brace horizontally along the depth dimension of the seat portion of the wheelchair, the first means and second means for adjusting the pelvic support brace horizontally being independently adjustable from one another along the depth dimension of the seat portion of the wheelchair; and

first means and second means for adjusting the pelvic support brace vertically above the height dimension of the seat portion of the wheelchair, the first means and second means for adjusting the pelvic support brace vertically being independently adjustable from one another above the height dimension of the seat portion of the wheelchair.

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